JPRS-UPM-86-001

21 January 1986

USSR Report

PHYSICS AND MATHEMATICS

FBIS FOREIGN BROADCAST INFORMATION SERVICE

NOTE

JPRS publications contain information primarily from foreign newspapers, periodicals and books, but also from news agency transmissions and broadcasts. Materials from foreign-language sources are translated; those from English-language sources are transcribed or reprinted, with the original phrasing and other characteristics retained.

Headlines, editorial reports, and material enclosed in brackets [] are supplied by JPRS. Processing indicators such as [Text] or [Excerpt] in the first line of each item, or following the last line of a brief, indicate how the original information was processed. Where no processing indicator is given, the information was summarized or extracted.

Unfamiliar names rendered phonetically or transliterated are enclosed in parentheses. Words or names preceded by a question mark and enclosed in parentheses were not clear in the original but have been supplied as appropriate in context. Other unattributed parenthetical notes within the body of an item originate with the source. Times within items are as given by source.

The contents of this publication in no way represent the policies, views or attitudes of the U.S. Government.

PROCUREMENT OF PUBLICATIONS

JPRS publications may be ordered from the National Technical Information Service (NTIS), Springfield, Virginia 22161. In ordering, it is recommended that the JPRS number, title, date and author, if applicable, of publication be cited.

Current JPRS publications are announced in Government Reports Announcements issued semimonthly by the NTIS, and are listed in the Monthly Catalog of U.S. Government Publications issued by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

Correspondence pertaining to matters other than procurement may be addressed to Joint Publications Research Service, 1000 North Glebe Road, Arlington, Virginia 22201.

Soviet books and journal articles displaying a copyright notice are reproduced and sold by NTIS with permission of the copyright agency of the Soviet Union. Permission for further reproduction must be obtained from copyright owner.

JPRS-UPM-86-001

21 January 1986

USSR REPORT

PHYSICS AND MATHEMATICS

CONTENTS

CRYSTALS AND SEMICONDUCTORS

Fast Method of Growing Crystals for Nonlinear Optics
(NTR: PROBLEMY I RESHENIYA, 18 Jun-1 Jul 85)..... 1

Submillimetric-Wave Luminescence of CdS Single Crystals During Optical Pumping
(Yu.A. Mityagin, V.N. Murzin, et al.; KRATKIYE SOOBSHCHENIYA PO FIZIKE, No 5, May 85)..... 2

Stimulated Mandelstam-Brillouin Scattering in Crystals
(M. Sattikulov, V.V. Demanov, et al.; IZVESTIYA AKADEMII NAUK UZ SSR. SERIYA FIZIKO-MATEMATICHESKIKH NAUK, No 1, Jan-Feb 85)..... 3

Microwave Absorption in Glass Heated by Laser Radiation
(N. Ye. Kask, M.A. Kovalyev, et al.; FIZIKA I KHIMIYA STEKLA, No 1, Jan-Feb 85)..... 3

Impurity Absorption by Chalcogenide Glasses in CO Laser Emission Region
(V.G. Plotnichye.ko, V.K. Sysoyev; FIZIKA I KHIMIYA STEKLA, No 1, Jan-Feb 85)..... 4

Investigation of Degradation Processes in Electron-Beam Pumped CdS Lasers Using a Transmission Electron Microscope
(G.V. Bushuyeva, S.A. Pendor, et al.; AKADEMIYA NAUK SSSR, No 65, 1984)..... 4

Processes of Excitation and Relaxation by Nd^{3+} in Certain Semiconductor Matrices
(Arzu Ali ogly Memedov; AKADEMIYA NAUK SSSR INSTITUT OBSHCHEY FIZIKI. DISSERTATION ABSTRACTS)..... 5

GAS DYNAMICS

Effect of Diffusion Constraints on Composition of Vapor Phase During Growth of CdS and ZnSe Crystals
(Ye. I. Panasyuk, M.S. Kleybanov, et al.; KRATKIYE SOOBSHCHENIYA PO FIZIKE, No 6, Jun 85)..... 6

Toward the Theory of Shockwave Stability
(N.M. Kuznetsov; ZHURNAL EKSPERIMENTAL'NOY I TEORETICHESKOY FIZIKI, No 2, Feb 85)..... 6

FLUID DYNAMICS

Propagation of Shock Waves Through Petroleum Suspensions
(K.V. Mukuk, S.M. Makhkamov, et al.; IZVESTIYA AKADEMII NAUK UZBEKSKOY SSR: SERIYA TEKHNICHESKIKH NAUK, No 4, Jul-Aug 85)..... 8

Oscillation of a Finite Closed Cylindrical Shell Filled with Liquid
(V.I. Demchuk, V.N. Maksimovich, et al.; MATEMATICHESKIYE I FIZIKO-MEKHANICHESKIYE POLYA, No 21, 1985)..... 9

LASERS

Laser Radiation in ZnSe Excited by Gunn Domains in Streamer Discharge Channel
(V.D. Dubrov, I. Ismailov, et al.; KRATKIYE SOOBSHCHENIYA PO FIZIKE, No 6, Jun 85)..... 10

Generation of Synchronized Laser Pulses Using a Two-Pass Pockels Cell
(S.F. Goncharov, P.P. Pashinin, et al.; AKADEMIYA NAUK SSSR INSTITUT OBSHCHEY FIZIKI. KVANTOVAYA ELEKTRONIKA, No 60, 1984)..... 10

Investigation of Pulse Optical Discharges in Modes with Lateral Ejection
(V.I. Konov, A.S. Silenok; AKADEMIYA NAUK SSSR INSTITUT OBSHCHEY FIZIKI. KVANTOVAYA ELEKTRONIKA, No 124, 1984).... 11

Polarization of Scattered Radiation During Interaction of Laser Protons with Relativistic Electrons
(V.A. Murashova, G.S. Pashchenko, et al.; ZHURNAL EKSPERIMENTAL'NOY I TEORETICHESKOY FIZIKI, No 2, Feb 85)... 11

Uncooled Pulsed Zinc Oxide Semiconductor Laser
(O.V. Bolgankyevich, S.A. Darznyek, et al.; PIS'MA V ZHURNAL TEKHNICHESKOY FIZIKI, No 3, 12 Feb 85)..... 12

Tunable Flashlamp-Pumped Organic Dye Lasers
(V.A. Alekseyev, V.I. Zhil'tsov, et al.; ZHURNAL PRIKLADNOY SPEKTROSKOPII, No 5, Nov 84)..... 12

Threshold Conditions for Damage to Potassium Chloride Single Crystals Exposed to CW CO_2 Laser Radiation
(A.A. Blistanov, N.M. Voloshinskaya, et al.; KVANTOVAYA ELEKTRONIKA, No 12, Dec 84)..... 13

Statistical Synthesis of Algorithms for Optimal Processing of an Atmosphere-Distorted Poisson Image
(P.A. Bakut, S.D. Pol'skikh, et al.; KVANTOVAYA ELEKTRONIKA, No 12, Dec 84)..... 13

Generation of Frequency-Tunable Ultrashort Pulses in a Dynamic Distributed Feedback Laser
(V.I. Bezrodnyy, Ye. I. Zabello, et al.; KVANTOVAYA ELEKTRONIKA, No 12, Dec 84)..... 14

Recombination in Cu-Laser Plasma with High Buffer Gas Temperature
(B.L. Borovich, Ye.P. Nalegats, et al.; KVANTOVAYA ELEKTRONIKA, No 12, Dec 84)..... 14

Knife-Edge Diffraction for Extracting Radiation from a Non-transmitting Laser Cavity in the Vacuum Ultraviolet
(G.V. Peregudov, V.A. Chirkov; KVANTOVAYA ELEKTRONIKA, No 12, Dec 84)..... 15

Theory of Surface Damage to Nontransparent Materials by Laser Radiation
(A.A. Vedenov, O.P. Ivanov, et al.; KVANTOVAYA ELEKTRONIKA, No 12, Dec 84)..... 15

Transient Lasing Modes in a Synchronously Pumped Dye Laser
(A.I. Kovrigin, V.A. Nekhayenko, et al.; KVANTOVAYA ELEKTRONIKA, No 12, Dec 84)..... 16

Investigation of the Influence of Pump Profiling Along the Optical Axis on Telescopic-Cavity Electro-Ionization Laser Output Characteristics
(S.S. Kozyuchenok, V.A. Rodichkin, et al.; KVANTOVAYA ELEKTRONIKA, No 12, Dec 84)..... 16

Lasing Characteristics of a Positive Electrooptical Feedback Neodymium Laser
(A.V. Agashkov, Yu.F. Morgun; KVANTOVAYA ELEKTRONIKA, No 12, Dec 84)..... 17

Chlorine Monofluoride-Hydrogen Electric Discharge Chemical Laser
(V.B. Kolovskiy, S.A. Drobakha, et al.; KVANTOVAYA ELEKTRONIKA, No 12, Dec 84)..... 17

Possibility of Generating Asymmetrical Pumping Pulses by Nonlinear Inductance in a Discharge Loop Circuit
(B.V. Kruglov, V.P. Osetrov, et al.; AKADEMIYA NAUK SSSR, No 17, 1984)..... 18

Laser Cavities with Diffraction Gratings in Autocollimation Mode
(V.N. Bel'tyugov, V.N. Ochkin, et al.; AKADEMIYA NAUK SSSR, No 37, 1984)..... 18

Polarization Characteristics of a Secondary Gamma-Ray During Light Scattering by Relativistic Electrons
(V.A. Murashova, G.S. Pashchenko, et al.; AKADEMIYA NAUK SSSR, No 307, 1983)..... 19

Physical Factors Limiting Service Life of Copper Bromide Lasers
(N.K. Vuchkov; AKADEMIYA NAUK SSSR INSTITUT OBSHCHEY FIZIKI. DISSERTATION ABSTRACTS)..... 19

MAGNETOHYDRODYNAMICS

Experimental Investigation of Energy Dissipation in Magnetic Liquid Contained in Rotating Magnetic Field
(G.Ye. Kronkalns, M.M. Mayorov; MAGNITNAYA GIDRODINAMIKA, No 3, Jul-Sep 84)..... 20

Two-Dimensional MHD-Turbulence: Hierarchical Model
(P.G. Frik; MAGNITNAYA GIDRODINAMIKA, No 3, Jul-Sep 84).... 20

Unsteady MHD Flow in Annular Channel of a Radial Magnetic Field
(M.Ya. Antimirov, A.A. Kolyshkin; MAGNITNAYA GIDRODINAMIKA, No 3, Jul-Sep 84)..... 21

Allowance for Liquid Viscosity and Higher Spatial Harmonics of a Magnetic Field in Analyzing Velocity Distribution for MHD Induction Pumps
(R.R. Krushberg; MAGNITNAYA GIDRODINAMIKA, No 3, Jul-Sep 84)..... 22

Influence of Longitudinal Boundary Effect on Integral Characteristics of Linear Induction MHD Machines
(B.N. Siplivyy, I.M. Tolmach; MAGNITNAYA GIDRODINAMIKA, No 3, Jul-Sep 84)..... 22

Plasma Confinement in L-2 Stellarator with Ohmic Heating
(I.S. Shpigel'; FIZIKA PLAZMY, No 1, Jan 85)..... 23

NUCLEAR PHYSICS

Separation of ^{238}U and ^{237}Np Nuclei by Gamma-Quanta Intermediate Energies
(A.A. Kazakov, G.Ya. Kezerashvili, et al.; PISMA V ZHURNAL EKSPERIMENTAL'NOY I TEORETICHESKOY FIZIKI, No 10, 25 Nov 84) 24

Neutron Distribution of a Californium Source in a Medium Surrounded by Reflectors
(T. Saydmuradov, A.A. Kist, et al.; IZVESTIYA AKADEMII NAUK UZ SSR. SERIYA FIZIKO-MATEMATICHESKIKH NAUK, No 1, Jan-Feb 85)..... 24

Magnetic Protection Against Proton and Electron Streams
(T.G. Zhgenti; SOOBSHCHENIYA AKADEMII NAUK GRUZINSKOY SSR, No 3, Sep 84)..... 25

Multiplicity of Charged Particles in K^+p Interactions at 70GeV/sec
(I.A. Gritsayenko, V.M. Ron'zhin, et al.; YADERNAYA FIZIKA, No 1, Jan 85)..... 25

Near-Resonance Effects of Weak Neutral Currents of Electrons and New Quarks During Elastic $e\bar{e}$-Annihilation
(A.A. Pankov, I.S. Satsunkevich; YADERNAYA FIZIKA, No 1, Jan 85)..... 26

Moments of Multiplicity Distributions of Secondary Charged Particles in Proton-Nucleus and Nucleus-Nucleus Collisions
(N.K. Kutsidi, Yu.V. Tevzadze; YADERNAYA FIZIKA, No 1, Jan 85)..... 26

OPTICS AND SPECTROSCOPY

Selection of Geometric Conditions for Measuring Parameters of Relativistic Electron Beams by Light Scattering
(V.A. Zhuravlev, O.V. Karpov, et al.; ZHURNAL PRIKLADNOY SPEKTROSKOPII, No 5, Nov 84)..... 27

Meteorological Correction to Refraction of Optical Wave Beams
(V.P. Lukin, A.E. Melamud, et al.; IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: FIZIKA, No 8, Aug 85)..... 27

Asymptotic Stability of Self-Similar Solutions Manifold with Self-Focusing
(G.M. Frayman; ZHURNAL EKSPERIMENTAL'NOY I TEORETICHESKOY FIZIKI, No 2, Feb 85)..... 28

Adaptive Optics Elements for Laser Dispersion Cavities
(V.I. Kravchenko, Ye.G. Levchyenko, et al.; PIS'MA V ZHURNAL TEKHNICHESKOY FIZIKI, No 3, 12 Feb 85)..... 29

Photo Materials as Soft X-Radiation Detectors for High Temperature Plasma
(B.A. Blekhman, A.A. Galichiy, et al.; AKADEMIYA NAUK SSSR, No 64, 1984)..... 29

Application of Scintallation Detectors for X-Ray Diagnosis of Laser Plasma
(M.P. Kalashnikov, V.K. Lyapidevskiy, et al.; AKADEMIYA NAUK SSSR, No 64, 1984)..... 30

Influence of Perturbations of the Spectra of Polariton Raman Scattering of Light in Nonlinear Crystals
(V.S. Gorelik, L.G. Reznik, et al.; AKADEMIYA NAUK SSSR, No 6, 1984)..... 30

Laser Radiation Wavefront Reversal with Intermediate Frequency Conversion to Another Band
(V.I. Bespalov, M.A. Dvoretskiy, et al.; KVANTOVAYA ELEKTRONIKA, No 12, Dec 84)..... 31

Low Threshold Optical Discharge in an Aerodispersed Medium
(S.V. Zakharchenko, L.P. Semenov, et al.; KVANTOVAYA ELEKTRONIKA, No 12, Dec 84)..... 31

Influence of Laser Radiation on Induced Absorption Spectra of Pure Quartz Glass Optical Fibers
(Ye.M. Dianov, V.N. Karpechev, et al.; KVANTOVAYA ELEKTRONIKA, No 12, Dec 84)..... 32

Phase Transition Kinetics During Laser Vaporization of Metal
(V.I. Mazhukin, A.A. Samokhin; KVANTOVAYA ELEKTRONIKA, No 12, Dec 84)..... 33

Light Pulse Compression in a Fiber Glass Amplifier
(M.I. Dzhibladze, R.R. Erikashvili; KVANTOVAYA ELEKTRONIKA, No 12, Dec 84)..... 33

Analysis and Investigation of a Coherent Wavefield in the Focal Region of Radial-Symmetric Optical Elements
(A.G. Vasin, M.A. Golyo, et al.; AKADEMIYA NAUK SSSR, No 304, 1983)..... 34

The Form and Width of R-Lines and Paramagnetic Resonance Lines for Ruby
(T.V. Gvaladze; AKADEMIYA NAUK SSSR INSTITUT OBSHCHEY FIZIKI. DISSERTATION ABSTRACTS)..... 34

Correlation Properties of Optical Fields
(V.P. Vykov, G.V. Shepelev; AKADEMIYA NAUK SSSR. INSTITUT OBSHCHEY FIZIKI, LABORATORIYA VOLNOVYKH YAVLENIY, No 149, 1984)..... 35

Image Brightness Amplifiers in Projection Optics Systems
(C.I. Zemskov; AKADEMIYA NAUK SSSR INSTITUT OBSHCHEY FIZIKI. DISSERTATION ABSTRACTS)..... 35

OPTOELECTRONICS

The Role of Polarization Effects in the Detachment of an Electron from a Negative Ion in a Strong Alternating Electromagnetic Field
(P.A. Golovinskiy, I.Yu. Kiyan; AKADEMIYA NAUK SSSR, INSTITUT OBSHCHEY FIZIKI, LABORATORIYA VOLNOVYKH YAVLENIY, No 132, 1984)..... 36

Electron-Beam Focusing in High-Current Diode
(Yu.M. Gorbulin, D.M. Zlotnikov, et al.; FIZIKA PLAZMY, No 2, Mar-Apr 84)..... 36

PLASMA PHYSICS

Plasma-Emission Energy Conversion
(I.V. Kirsanov; INSTITUT OBSHCHEY FIZIKI AN SSSR. FIZIKA PLAZMY, No 41, 1984)..... 37

Analysis of Ion Energy Balance in an L-2 Stellarator Plasma
(S.Ye. Grebenshchikov, A.B. Izvozchikov, et al.; INSTITUT OBSHCHEY FIZIKI AN SSSR FIZIKA PLAZMY, No 53, 1984)..... 37

A Slow Ionizing High Frequency Electromagnetic Wave in a Thin Plasma Cylinder
(Yu.M. Aliyev, A.G. Boyev, et al.; INSTITUT OBSHCHEY FIZIKI AN SSSR. FIZIKA PLAZMY, No 55, 1984)..... 38

Cyclotron Absorption of a Fast Magnetosonic Wave in a Stellarator
(L.M. Kovrizhnykh, P. Ye. Moroz; INSTITUT OBSHCHEY FIZIKI AN SSSR. FIZIKA PLAZMY, No 130, 1984)..... 38

Heating of Ions During Scattering of Electromagnetic Waves at Frequencies Close to Cyclotron Resonance
(S.B. Isakov, V.N. Tsytovich; INSTITUT OBSHCHEY FIZIKI AN SSSR FIZIKA PLAZMY, No 134, 1984)..... 39

Superradiance in an Undulator in Dual Resonance Mode
(L.S. Bogdankevich, L.K. Gelkhviidze, et al.; INSTITUT OBSHCHEY FIZIKI AN SSSR. FIZIKA PLAZMY, No 151, 1984)..... 39

Two-Dimensional Plasma Flows in a Current Layer According to Results of Spectral Measurements
(N.P. Kiriy, V.S. Markov, et al.; INSTITUT OBSHCHEY FIZIKI AN SSSR FIZIKA PLAZMY, No 193, 1984)..... 40

Diagnostic Method for HF Electrical Fields in Plasma
(V.L. Gol'tsman, Yu.V. Zadiraka, et al.; AKADEMIYA NAUK SSSR, INSTITUT OBSHCHEY FIZIKI, FIZIKA PLAZMY, LABORATORIYA FIZIKI PLAZMY, No 173, 1984)..... 40

Radiation Supercooling of Bulk-Ionized Plasma of Multiply Charged Ions
(F. V. Bunkin, V.I. Derzhiyev, et al.; AKADEMIYA NAUK SSSR, INSTITUT OBSHCHEY FIZIKI, LABORATORIYA VOLNOVYKH YAVLENIY, No 221, 1984)..... 41

Structure of a Shock Wave in Plasma Considering Recombination and Ionization. I. Stationary Shock Wave
(V.I. Derzhiyev, S.A. Mayorov, et al.; AKADEMIYA NAUK SSSR INSTITUT OBSHCHEY FIZIKI, LABORATORIYA VOLNOVYKH YAVLENIY, No 220, 1984)..... 41

Amplification of Light at H-Ion Transitions During Free Expansion of Thin Plasmoids of Cylindrical Configuration (Two-Pulse Pumping)
(A.V. Borovskiy, V.V. Korobkin, et al.; AKADEMIYA NAUK SSSR INSTITUT OBSHCHEY FIZIKI, LABORATORIYA VOLNOVYKH YAVLENIY, No 159, 1984)..... 42

Amplification of Light at H-Ion Transitions During Free Expansion of Thin Cylindrical Plasmoids (Adiabatic Expansion)
(A.V. Borovskiy, V.V. Korobkin, et al.; AKADEMIYA NAUK SSSR, INSTITUT OBSHCHEY FIZIKI, LABORATORIYA VOLNOVYKH YAVLENIY, No 157, 1984)..... 42

Amplification of Light in Recombination-Nonequilibrium H-Ion Plasma
(A.V. Borovskiy, V.K. Klinkov, et al.; AKADEMIYA NAUK SSSR, INSTITUT OBSHCHEY FIZIKI, LABORATORIYA VOLNOVYKH YAVLENIY, No 51, 1984)..... 43

Formation of Supercooled Plasma by Radiation Losses in a Continuous Spectrum
(F.V. Bunkin, V.I. Derzhiyev, et al.; AKADEMIYA NAUK SSSR, INSTITUT OBSHCHEY FIZIKI, LABORATORIYA VOLNOVYKH YAVLENIY, No 63, 1984)..... 43

Branches of Thermal Physics and Applications Discussed
(S. Kutateladze; NTR: PROBLEMY I RESHENIYA, 2-15 Jul 85)... 44

Microchannel Analyzer for Recording Particle and X-Ray Emission from Laser Plasma
(L.Z. Barabash, B.N. Bragin, et al.; KRATKIYE SOOBSHCHENIYA PO FIZIKE, No 5, May 85)..... 45

Magnetic Analyzer of High-Energy Ions from Thermonuclear Targets Compressed by Laser Beam
(A.A. Yerokhin, Yu. A. Zakharenkov, et al.; KRATKIYE SOOBSHCHENIYA PO FIZIKE, No 5, May 85)..... 46

A Mechanism for Plasma Mirror Formation in a Cavity
(V.I. Fisher; ZHURNAL EKSPERIMENTAL'NOY I TEORETICHESKOY FIZIKI, No 2, Feb 85)..... 47

Hydrodynamics of Plasma Compression with a Magnetic Field by a Thin Cylindrical Wall
(A.L. Velikovich, S.M. Golberg, et al.; ZHURNAL EKSPERIMENTAL'NOY I TEORETICHESKOY FIZIKI, No 2, Feb 85)... 47

Forces Acting Upon a Plasma Filament in Transverse Multipole Magnetic Fields
(M.L. Levin, M.S. Rabinovich; FIZIKA PLAZMY, No 1, Jan 85). 48

Investigation of Current Generation by Lower Hybrid Waves in a T-7 Tokamak
(V.V. Alikayev, Yu.V. Grozdkov, et al.; FIZIKA PLAZMY, No 1, Jan 85)..... 48

Formation of a Current Profile at the T-10 Tokamak Installation
(G.Ye. Notkin; FIZIKA PLAZMY, No 1, Jan 85)..... 49

Behavioral Characteristics of the Function of Ion Distribution in a Tokamak Plasma During Magnetic Adiabatic Compression
(A.I. Kislyakov, A.V. Krasil'nikov, et al.; FIZIKA PLAZMY, No 1, Jan 85)..... 49

Charged Particle Beam Self-Focusing in Inhomogeneous Plasma
(V.V. Gorev, S.V. Zakharov; FIZIKA PLAZMY, No 1, Jan 85)... 50

Laser-Driven X-Ray Emission from a Plasma Focus
(V.A. Gribkov, S. Denus, et al.; FIZIKA PLAZMY, No 1, Jan 85)..... 50

Progress in Controlled Fusion Research Described
(L. Sorin; MOSKOVSKAYA PRAVDA, 24 Nov 85)..... 51

SUPERCONDUCTIVITY

Moving Solitons in Superconductors and Peyerls Systems
(S.V. Panyukov; KRATKIYE SOOBSHCHENIYA PO FIZIKE, No 5, May 85)..... 53

THERMODYNAMICS

Temperature Diagnosis of a Mixture of Molecular Gases Heated by CW CO_2 Laser
(R. Aleksandresku, F.V. Bunkin, et al.; AKADEMIYA NAUK SSSR, INSTITUT OBSHCHEY FIZIKI, LABORATORIYA VOLNOVYKH YAVLENIY, No 223, 1984)..... 54

Influence of Convective Heat Transfer in Thermal Stress State of Transversely Isotropic Sphere
(V.I. Gromovyk, S.T. Stasyuk, et al.; MATEMATICHESKIYE METODY I FIZIKO-MEKHANICHESKIYE POLYA, No 21, 1985)..... 54

Temperature Stresses in a Thin Plate Heated by a Periodic System of Heat Sources
(V. S. Popovich, I.I. Natalyuk; MATEMATICHESKIYE METODY I FIZIKO-MEKHANICHESKIYE POLYA, No 21, 1985)..... 55

Thermoelasticity Problem for Strip Plates Heated by a Moving Heat Source
(A.N. Kulik; MATEMATICHESKIYE METODY I FIZIKO-MEKHANICHESKIYE POLYA, No 21, 1985)..... 55

THEORETICAL PHYSICS

Synchrotron Radiation of an Electron in Coherent State
(A.A. Bobrov, O.F. Dorofeyev, et al.; TEORETICHESKAYA I MATEMATICHESKAYA FIZIKA, No 2, Nov 84)..... 56

Determination of Stochastization Boundary of Perturbation Movement by IR Laser Excitation and Electron Collision
(V.M. Akulin, V.D. Vurdov, et al.; PIS'MA V ZHURNAL EKSPERIMENTAL'NOY I TEORETICHESKOY FIZIKI, No 10, 25 Nov 84)..... 56

Propagation of Acousticoelectric Wave in Piezoceramic Hollow Cylinder and Layer
(I.A. Loza, N.A. Shulga; MATEMATICHESKIYE METODY I FIZIKO-MEKHANICHESKIYE POLYA, No 21, 1985)..... 57

Optimization of Dynamic Effects Upon Rotation of Axisymmetrical Body Around its Axis
(B.V. Gera; MATEMATICHESKIYE METODY I FIZIKO-MEKHANICHESKIYE POLYA, No 21, 1985)..... 57

Optimization of Force Load in Cylindrical Shell with Finite Shear Rigidity
(N.I. Bugriy; MATEMATICHESKIYE METODY I FIZIKO-MEKHANICHESKIYE POLYA, No 21, 1985)..... 58

Nonlinear Propagation of Spatially Bounded Transverse Waves Through Isotropic Solid Medium
(Ye.A. Zabolotskaya; KRATKIYE SOOBSHCHENIYA PO FIZIKE, No 6, Jun 85)..... 58

Generalized Model of Random Matrices: Statistical and Correlation Properties of Operators in Variable Basis
(P.M. Isayev; YADERNAYA FIZIKA, No 1, Jan 85)..... 59

Nonlinear Stage of Rayleigh-Taylor Instability
(Ye.G. Gamaliy, P.A. Loboda, et al.; AKADEMIYA NAUK SSSR, No 27, 1984)..... 59

Perturbation of Interface Surface During Phase Transitions Resulting from Strong Monochromatic Radiation
(A.A. Samokhin; AKADEMIYA NAUK SSSR, No 34, 1984)..... 60

Two Types of Nonlinear Optical Susceptibility
(An.V. Vinogradov; AKADEMIYA NAUK SSSR, No 42, 1984)..... 60

LOGIC AND GAME THEORY

Differential Games of Pursuit with Integral Constraints
(Ye.M. Mukhsinov; DOKLADY AKADEMII NAUK TADZHIKSKOY SSR, No 5, May 85)..... 61

Positional L-Capture in a Game of One Pursued and Several Pursuers
(B.K. Khaydarov; PRIKLADNAYA MATEMATIKA I MEKHANIKA, No 4, Jul-Aug 84)..... 61

NUMERICAL ANALYSIS AND STATISTICS

Conference Marks Anniversary of University's Mathematics Chairs
(A. Flyaysher; SOVETSKAYA ESTONIYA, No 241, 18 Oct 85)..... 62

Computerization Demands Advanced Mathematical Modeling
(A.A. Samarskiy; NTR: PROBLEMY I RESHENIYA, No 5, 16 Jul-3 Aug 85)..... 63

NUMERICAL ANALYSIS AND ALGORITHMS

Some Theory of Approximation and Numerical Analysis Problems
(K.I. Babenko; USPEKHI MATEMATICHESKIKH NAUK, No 1 (241), Jan-Feb 85)..... 65

Weighted Search for Solution of Multiobjective Mathematical Programming Problem
(M.V. Tukhvatov; IZVESTIYA AKADEMII NAUK UZSSR. SERIYA TEKHNICHESKIKH NAUK, No 6, Nov-Dec 84)..... 65

Application of Uniformly Distributed Sequences in Computational Mathematics
(I.M. Sobol'; MATEMATIKA, KIBERNETIKA. PODPISNAYA NAUCHNO-POPULYARNAYA SERIYA, No 2, Feb 85)..... 66

Fast Algorithm for Solving a Network Distribution Problem and its Application
(K.V. Kim, O.V. Ni; IZVESTIYA AKADEMII NAUK KAZAKHSKOY SSR. SERIYA FIZIKO-MATEMATICHESKAYA, No 1 (122), Jan-Feb 85)..... 66

PROBABILITY AND STATISTICS

Asymptotic Behavior of Projection Estimates for Probability Distribution Density
(T.G. Buadze; SOOBSHCHENIYA AKADEMII NAUK GRUZINSKOY SSR, No 3, Sep 84)..... 67

CONTROL THEORY

Principles of Multivariant Domination in Optimum Control of Technological Processes
(E.M. Aliyev; IZVESTIYA AKADEMII NAUK UZSSR. SERIYA TEKHNICHESKIKH NAUK, No 6, Nov-Dec 84)..... 68

Regularization of Ill-Posed Optimum Control Problems for Processes Described by Parabolic Equations
(V.S. Neronov; IZVESTIYA AKADEMII NAUK KAZAKHSKOY SSR. SERIYA FIZIKO-MATEMATICHESKAYA, No 1 (122), Jan-Feb 85)... 68

Convergence of Successive Refinements of Optimum Trajectory Projections
(T.Yu. Tsintsadze; SOOBSHCHENIYA AKADEMII NAUK GRUZINSKOY SSR, No 3, Sep 84)..... 69

The Problem of Control Under Conditions of Incomplete Information
(N.N. Krasovskiy; PRIKLADNAYA MATEMATIKA I MEKHANIKA, No 4, Jul-Aug 84)..... 69

Simulation Problem of Controlling Lateral Movement of Aircraft During Landing Approach
(N.D. Botkin, V.M. Keyn, et al.; PRIKLADNAYA MATEMATIKA I MEKHANIKA, No 4, Jul-Aug 84)..... 69

OPERATIONS RESEARCH

Parametric Optimization of Algorithm for Estimating Values of One Class of Unsteady Random Processes
(G.A. Kryzhanovskiy, V.I. Aleshin; IZVESTIYA AKADEMII NAUK KAZAKHSKOY SSR: SERIYA FIZIKO-MATEMATICHESKAYA, No 5, Sep-Oct 84)..... 71

Model of Optimum Production Control Based on Theory of Stockpile Control
(A.V. Serbulov, K. Tumenbayev; IZVESTIYA AKADEMII NAUK UZBEKSKOY SSR: SERIYA TEKHNICHESKIKH NAUK, No 4, Jul-Aug 85)..... 71

Search for a Stationary Target by a Moving Object
(G.Ts. Chikriy; PRIKLADNAYA MATEMATIKA I MEKHANIKA, No 4, Jul-Aug 84)..... 72

DIFFERENTIAL EQUATIONS

Numerical Solution of Rigid Boundary-Value Problems Occurring in Transfer Theory
(U.M. Sultangazin, A.G. Khamidov; IZVESTIYA AKADEMII NAUK KAZAKHSKOY SSR. SERIYA FIZIKO-MATEMATICHESKAYA, No 1 (122), Jan-Feb 85)..... 73

CRYSTALS AND SEMICONDUCTORS

FAST METHOD OF GROWING CRYSTALS FOR NONLINEAR OPTICS

Moscow NTR: PROBLEMY I RESHENIYA, 18 Jun-1 Jul 85 p 4

[Text] A new method for rapidly growing nonlinear optical crystals from aqueous solutions has been developed at the USSR Academy of Sciences' Institute of Applied Physics in Gor'kiy. Such crystals are used for controlling laser beams. They make it possible to deflect the beam, change its wavelength, etc.

Previously, the rate of growth of such crystals was about 0.5-1.0 millimeters per day. For example, it took more than a year to grow a crystal 15 millimeters in diameter, from which an element for multiplying the beam frequency is made. On the basis of the proposed method, equipment and a process for growing crystals at a rate of 0.5-1.0 millimeters per hour have been developed. This shortens the time it takes to grow a crystal to several days.

(A photograph is given showing a scientist studying the properties of a large potassium dihydrophosphate crystal grown by the new method).

FTD/SNAP
/9716
CSO: 1862/60

UDC 621.315.572:535.37

SUBMILLIMETRIC-WAVE LUMINESCENCE OF CdS SINGLE CRYSTALS DURING OPTICAL PUMPING

Moscow KRATKIYE SOOBSHCHENIYA PO FIZIKE in Russian No 5, May 85 (manuscript received 1 Feb 85) pp 28-31

MITYAGIN, Yu.A., MURZIN, V.N. and STOKLITSKIY, S.A., Institute of Physics imeni P.N. Lebedev, USSR Academy of Sciences

[Abstract] An experimental study of CdS single crystals was made, concerning their emission of submillimetric-wave radiation during high-intensity pumping. Specimens of CdS crystals were placed on the cold plate of a helium cryostat and excited over a spot 0.3-1 mm in diameter either by an N_2-laser with radiation pulses of 10 ns duration and approximately 1 kW power at the 337.1 nm wavelength or by a Q-switched YAG-laser with third-harmonic radiation pulses of 10 ns duration and 10 kW power at the 335 nm wavelength. The temperature of a specimen was varied over the 10-180 K range by adjustment of the pumping pulse repetition rate and was read either by the position of the green laser emission line or, within the 1.6-4.2 K range, by a thermometer also immersed in the liquid helium. Only thermal radiation was detected at temperatures below 100 K, attributable to adiabatic heating of the surface layer. Intense submillimetric-wave luminescence within the 50-90 μm range of wavelengths was recorded by a Ge(Ga) detector above the 100 K threshold, its power increasing almost linearly and reaching levels 2-3 orders of magnitude above that of thermal radiation. This luminescence is attributable to 2p-1s transitions of A-excitons from excited state to ground state, at a frequency corresponding to those wavelengths. The authors thank G.K. Vlasov for helpful discussions and A.D. Levit for supplying CdS single crystals. Figures 2; references 8: 3 Russian, 5 Western.
[54-2415]

UDC: 535.375

STIMULATED MANDELSTAM-BRILLOUIN SCATTERING IN CRYSTALS

Tashkent IZVESTIYA AKADEMII NAUK UZ SSR. SERIYA FIZIKO-MATEMATICHESKIKH NAUK No 1, Jan-Feb 85 (manuscript received 6 Jun 82) pp 74-78

SATTIKULOV, M., DEMANOV, V.V. and MUMINOV, V.A., Bukhara State Pedagogical Institute imeni S. Ordzhonikidze.

[Abstract] Optical and acoustic aspects of collinear stimulated Mandelstam-Brillouin scattering are investigated simultaneously ir a number of crystals (SiO_2, $LiNbO_3$ and Al_2O_3) for forward- and back-scattering. The stimulated emission thresholds are measured under identical experimental conditions for the same crystals, and the generation of acoustic (ultrasonic) waves during forward scattering stimulated emission is investigated. All other conditions being equal, it is found that the experimental threshold for stimulated Mandelstam-Brillouin backscattering is nigher than for forward scattering. References 5: 4 Russian, 1 Western.
[372-6900]

UDC 621.11.01

MICROWAVE ABSORPTION IN GLASS HEATED BY LASER RADIATION

Leningrad FIZIKA I KHIMIYA STEKLA in Russian Vol 11, No 1, Jan-Feb 85 (manuscript received 14 Apr 82) pp 68-74

KASK, N. Ye., KOVALYEV, M. A., FEDOROV, G.M. and CHOPORNYAK, D.B., Scientific Research Institute for Nuclear Physics, Moscow State University imeni M.V. Lomonosov

[Abstract] The possibility of investigating the conductivity of glass by using local laser heating and microwave diagnosis is demonstrated. The results of conductivity testing for ZhS 12 silicate glass is presented. The proposed microwave measurement method makes it possible to investigate the electrical properties of glass-like materials over a wider range of temperatures. Structural realignments show up during rapid laser heating at temperatures exceeding 1300 K, thus expanding the interval in which glass conductivity can be investigated in the solid state. The proposed method can be used to study glass-forming matter at up to approximately 2500 K in the melted state, and in the plasma state at even higher temperatures. The solid state conductivity of ZhS 12 glass is characterized by an activation energy of 0.18 eV; that of the melted state is 0.85 eV. References 14: 13 Russian, 1 Western.
[360-6900]

UDC 666.11.01:535.343

IMPURITY ABSORPTION BY CHALCOGENIDE GLASSES IN CO LASER EMISSION REGION

Leningrad FIZIKA I KHIMIYA STEKLA in Russian Vol 11, No 1, Jan-Feb 85 (manuscript received 23 June 83) pp 105-107

PLOTNICHYENKO, V.G. and SYSOYEV, V.K., Physics Institute imeni P.N. Lebedev USSR Academy of Sciences

[Abstract] The mechanism governing the high optical losses in chalcogenide glasses in the region of CO laser radiation (5-6 μm) is determined by investigating laboratory and commercial specimens of arsenic trisulfide and arsenic triselinide glasses, as well as commercial IKS series glasses. In examining the transmission spectra of various chalcogenide glasses, high nonselective absorption is noted in the emission region of CO lasers. This absorption occurs on impurities, which can be seen in As_2S_3 by ordinary microscopy, and in As_2Se_3 and IKS-29 by infrared microscopy. Atomary carbon and silicon dioxide are felt to determine the high level of optical losses in the frequency range in question. References 8: 4 Russian, 4 Western. [360-6900]

INVESTIGATION OF DEGRADATION PROCESSES IN ELECTRON-BEAM PUMPED CdS LASERS USING A TRANSMISSION ELECTRON MICROSCOPE

Moscow AKADEMIYA NAUK SSSR Preprint No 65 in Russian 1984

BUSHUYEVA, G.V., PENDOR, S.A., PECHENOV, A.N., PREDVODITELEV, A.A., RESHETOV, V.I. and SHAPKIN, P.V., Physics Institute imeni P.N. Lebedev, USSR Academy of Sciences.

[Abstract] This study describes the use of transmission electron microscopy to identify structural defects occurring during the growth and irradiation of cadmium sulfide by a focused electron beam with electron energy of up to 100 keV and current density up to 300 A/cm^2. The influence of these defects on the radiating properties of the semiconductor is studied. A JFM-100 U electron microscope was employed. Cathode luminescence measurements and long term irradiation of CdS crystals 40-60 μm thick were performed in a cathode ray tube. Plate and bulk CdS crystals were found to exhibit significant numbers of defects at 300° K, which can be classified as small segregations with maximum volumetric density of approximately $10^{14}cm^{-3}$. Besides segregations, individual dislocations and groups of dislocations were observed in large CdS crystals. Electron microscope investigation of CdS revealed both motion and multiplication of dislocations in the base plane. The segregation density is found to depend strongly upon the growth conditions. The fast stage of gradual crystal degradation in metastable crystals is strongly influenced by the process associated with the increased space taken up by segregations. References 16: 13 Russian, 3 Western. [335-6900]

UDC: 621.373.8.038.825

PROCESSES OF EXCITATION AND RELAXATION BY Nd^{3+} IN CERTAIN SEMICONDUCTOR MATRICES

Moscow AKADEMIYA NAUK SSSR INSTITUT OBSHCHEY FIZIKI. DISSERTATION ABSTRACTS, in Russian.

MAMEDOV, Arzu Ali ogly.

[Abstract] Population mechanisms of the upper lasing level of neodymium in α-$La_2S_3:Nd^{3+}$ crystals and $La_2S_3 \cdot 2Ga_2O_3:Nd^{3+}$ $La_2S_3 \cdot 2Ga_2S_3:Nd^{3+}$ glasses are established. Unsteady radiation of neodymium is detected from states above the metastable state caused by low rate of relaxation of excitation from the absorption bands into the metastable state. The inter-multiplet transitions responsible for unsteady radiation are identified. The decay curves of the metastable state of neodymium in La_2O_2S, $La_2S_3 \cdot 2Ga_2O_3$, and $La_2S_3 \cdot 2Ga_2S_3$ are calculated throughout the entire time interval investigated. The minimum distances between neodymium ions in glasses are determined. References 6 Russian.
[333-6900]

GAS DYNAMICS

UDC 548.57

EFFECT OF DIFFUSION CONSTRAINTS ON COMPOSITION OF VAPOR PHASE DURING GROWTH OF CdS AND ZnSe CRYSTALS

Moscow KRATKIYE SOOBSHCHENIYA PO FIZIKE in Russian No 6, Jun 85 (manuscript received 1 Feb 85) pp 6-9

PANASYUK, Ye. I., KLEYBANOV, M.S., LEVIT, A.D. and YAKUSHIN, V.K., Institute of Physics imeni P.N. Lebedev, USSR Academy of Sciences

[Abstract] Evolution of the vapor phase during growth of CdS and ZnSe crystals in a vertical reactor with helium by the Markov-Davydov method is analyzed on the basis of a model which takes into account mechanical and thermal diffusion of the components besides interdiffusion of each with helium. Considering that mass transfer by both diffusion mechanisms is the limiting stage of the growth process, the corresponding equations which describe the process are solved for the ratio of partial pressures $P_{Cd,Zn}/P_{S,Se}$ and its profile along the growth axis in the reactor. This ratio is found to decrease or increase along the axis depending on the direction of departure from the equilibrium condition at the source, with the magnitude of decrease or increase increasing as the deviation from that equilibrium condition increases. The effect of thermal diffusion becomes more appreciable with lowering of the absolute temperature and with increasing of the temperature gradient. Figures 1; tables 2; references 5: 4 Russian, 1 Western.
[53-2415]

TOWARD THE THEORY OF SHOCKWAVE STABILITY

Moscow ZHURNAL EKSPERIMENTAL'NOY I TEORETICHESKOY FIZIKI in Russian Vol 88, No 2, Feb 85 (manuscript received 29 Jul 84) pp 470-486

KUZNETSOV, N.M., Institute of Chemical Physics, USSR Academy of Sciences.

[Abstract] The stability of a shock wave with respect to perturbations of arbitrary intensity is investigated on the basis of the general theory of the decay in branches of arbitrary discontinuities. The conditions for the decay of a shock wave into other component elements are analyzed. The criteria for

wave stability, and wave evolution in cases in which the criteria are not satisfied, are determined. The limits of shockwave stability with respect to small perturbations of the front surface are found. It is concluded that shockwaves that are unstable in the ordinary sense--with a gradual increase in weak perturbation--do not exist: shockwaves can only be stable or decaying. The stationarity and attenuation criteria of a configuration of three waves, one of which is weak and propagates across the surface of the front of the original non-decaying shockwave, are the same as the stationarity of attenuation criteria for weak deformations of the surface of the front. References 25: 18 Russian, 7 Western.
[246-6900]

UDC 532.59

PROPAGATION OF SHOCK WAVES THROUGH PETROLEUM SUSPENSIONS

Tashkent IZVESTIYA AKADEMII NAUK UZBEKSKOY SSR: SERIYA TEKHNICHESKIKH NAUK in Russian No 4, Jul-Aug 85 (manuscript received 27 Jan 84) pp 50-52

MUKUK, K.V., MAKHKAMOV, S.M. and AZIZOV, Kh.Kh., Central Asiatic Scientific Research and Planning Institute of Petroleum Industry

[Abstract] An experimental study of anomalous shock wave propagation through petroleum with a high paraffin content was made, in an attempt to confirm the theoretically predicted breakdown of a forward shock wave into oscillating waves and wave packets as well as individual solitons. Tests were performed in a shock tube at 10°C, 20°C, and 50-60°C, with pure kerosene as reference and with kerosene + 5,10,15,20% paraffin. The addition of paraffin was found to radically alter the rheodynamic characteristics of the medium and, along with it, the pattern of shock wave propagation. With up to 5% paraffin in the mixture at 10°C and 20°C, the pressure oscillograms revealed high-frequency oscillations at 20-25 kHz and low-frequency oscillations at up to 2 kHz with amplitudes reaching half the initial shock intensity. With 20% paraffin in the mixture at 50-60°C, all solid paraffin having melted in kerosene, the pressure oscillograms did not differ from those corresponding to pure kerosene. These results indicate that the theory of shock wave propagation through such anomalous suspension must be modified. This is done on the basis of premises applicable to general wave dynamics of polyphase gas-liquid media, with acoustic as well as rheological characteristics of petroleum taken into account. The corresponding integro-differential equation describing a one-dimensional hydraulic shock process in viscoelastic fluids is reduced to the Burgers-Korteweg-deVries equation and the latter is solved numerically for given values of the system parameters. Quantitative estimates on this basis indicate that at 10°C paraffin added in amounts up to 5% causes the velocity of a shock wave to increase from 1290 m/s to 1524 m/s. At that temperature, according to these estimates, increasing the paraffin content first to 10% and then to 20% will give rise, first, to low-frequency oscillations and then to breakdown of initial shock wave perturbations into wave packets. As the paraffin content is increased from 5% to 20%, moreover, the relaxation time increases from 0.047 s to 0.187 s, while the frequency of oscillations drops from 25 kHz to 1 kHz. Tables 2; references: 9 Russian.
[51-2415]

UDC: 534.26

OSCILLATION OF A FINITE CLOSED CYLINDRICAL SHELL FILLED WITH LIQUID

Kiev MATEMATICHESKIYE METODY I FIZIKO-MEKHANICHESKIYE POLYA in Russian No 21, 1985 (manuscript received 25 Oct 82) pp 71-75

DEMCHUK, V.I., MAKSIMOVICH, V.N. and PLYATSKO, G.V., Institute of Applied Mechanics and Mathematics Problems, Ukrainian Academy of Sciences, Lvov.

[Abstract] A study is made of the problem of induced oscillations caused by a point pressure source in a circular finite cylindrical shell which is closed at the ends by bases consisting of elastic plates elastically joined to the shell and filled with an ideal compressible fluid. The solution to the problem is found using Fourier and Fourier-Bessel series, for which the operations of differentiation in a closed space are generalized. An infinite system of linear algebraic equations is obtained. The method suggested can be effectively used to solve similar problems in hydroacoustics in which the series is used for the fluid and the surrounding elastic envelope. References 6 Russian. [028-6508]

LASERS

UDC 621.373:826.038

LASER RADIATION IN ZnSe EXCITED BY GUNN DOMAINS IN STREAMER DISCHARGE CHANNEL

Moscow KRATKIYE SOOBSHCHENIYA PO FIZIKE in Russian No 6, Jun 85 (manuscript received 30 Jan 85) pp 3-5

DUBROV, V.D., ISMAILOV, I., OBIDIN, A.Z., PECHENOV, A.N. and POPOV, Yu.M., Institute of Physics imeni P.N. Lebedev, USSR Academy of Sciences

[Abstract] Laser radiation in ZnSe was obtained experimentally by combining impact ionization in a Gunn diode with directional streamer discharge, each method alone being capable of producing strong electric field pulses for appropriate excitation of ZnSe but each having its limitations. Specimens of 25 μm thick plane-parallel ZnSe plates were coated with dielectric mirror on both sides of a quality corresponding to an overall reflection coefficient $R_1 \cdot R_2 = 0.98$ and then excited with 55 kV voltage pulses of 10 ns duration. The experimental data indicate that laser sources in ZnSe appear upon formation of Gunn strong-field domains in the discharge channel, with discharge above the Gunn-effect threshold and with domains moving through the crystal at a velocity of $(1\text{-}1.5) \cdot 10^7$ cm/s. The radiation power in the emission mode was 50 W at a temperature of 300 K, but optimization of both resonator and excitation circuit should make higher power levels feasible. Figures 2; references 9: 4 Russian, 5 Western.
[53-2415]

GENERATION OF SYNCHRONIZED LASER PULSES USING A TWO-PASS POCKELS CELL

Moscow AKADEMIYA NAUK SSSR INSTITUT OBSHCHEY FIZIKI. KVANTOVAYA ELEKTRONIKA, 1984, Preprint No 60 in Russian, (signed to press 16 Jan 84)

GONCHAROV, S.F., PASHININ, P.P., SEROV, R.V., SMIRNOV, A.V., CHVYKOV, V.V. and YANOVSKIY, V.P., Institute of General Physics, USSR Academy of Sciences.

[Abstract] The use of a two-pass Pockels cells to generate a sounding radiation pulse that is synchronized with the heating pulse is proposed. This approach simplifies the generator, and makes it possible to exploit the additional capabilities of controlling the parameters of the sounding radiation inherent

in the scheme. The operation of the two-pass cell is analyzed quantitatively. The pulse duration of approximately 800 psec obtained can be reduced to reduce the duration of the sounding radiation. References 6: 5 Russian, 1 Western. [325-6900]

INVESTIGATION OF PULSE OPTICAL DISCHARGES IN MODES WITH LATERAL EJECTION

Moscow AKADEMIYA NAUK SSSR INSTITUT OBSHCHEY FIZIKI. KVANTOVAYA ELEKTRONIKA, 1984, Preprint No 124 (signed to press 28 May 84)

KONOV, V.I. and SILENOK, A.S., Institute of General Physics, USSR Academy of Sciences.

[Abstract] Optical discharges in the beam of a pulse Co_2 laser are investigated experimentally and theoretically under conditions in which lateral gas dynamic expansion of the plasma from the zone of the discharge is significant. The experiments employed a TEA-CO_2 laser producing pulse energy of up to 6 J. The experiments were conducted in air at atmospheric pressure. The experiments reveal that the brightness temperatures are highest near the front of the discharge, and that the length of the glowing region increases as the intensity of the laser pulse becomes smaller during the later stages of plasma development. Pre-detonation propagation modes of optical discharges with lateral ejection of gas are analyzed. References 15: 13 Russian, 2 Western. [325-6900]

POLARIZATION OF SCATTERED RADIATION DURING INTERACTION OF LASER PROTONS WITH RELATIVISTIC ELECTRONS

Moscow ZHURNAL EKSPERIMENTAL'NOY I TEORETICHESKOY FIZIKI in Russian Vol 88, No 2, Feb 85 (manuscript received 4 Jun 84) pp 336-341

MURASHOVA, V.A., PASHCHENKO, G.S. and YAKIMENKO, M.N., Physics Institute imeni P.N. Lebedev, USSR Academy of Sciences.

[Abstract] The polarization characteristics of scattered radiation from a ruby laser on an internal electron beam with near-perpendicular geometry is investigated experimentally; the possibility of producing and controlling the parameters of such a beam is assessed based on analysis of the operation employed in the experiment, which was based on a Compton scintillation polarimeter. It is shown that a laser gamma-beam with assigned polarization properties and having intensity exceeding 10^4 quanta in acceleration cycle can be created. References 11: 6 Russian, 5 Western. [246-6900]

UNCOOLED PULSED ZINC OXIDE SEMICONDUCTOR LASER

Leningrad PIS'MA V ZHURNAL TEKHNICHESKOY FIZIKI in Russian Vol 11, No 3, 12 Feb 85 (manuscript received 5 Sep 84) pp 136-140

BOLGANKYEVICH, O.V., DARZNYEK, S.A., ZVYERYEV, M.M., KOSTIN, N.N., KRASAVINA, Ye. M., KRYUKOVA, I.V., MARKOV, Ye.V., SMIRNOV, V.V. and USHAKHIN, V.A.

[Abstract] The output parameters of a zinc oxide laser operating at room temperature with no special cooling are optimized. Maximum output power of 300 kW is obtained from a multielement target for a coefficient of reflection of the output mirror of 0.6. The efficiency of the multielement laser can be made near-optimum by optimizing the design of the target. A spectrum half-width of 2.5 nm, with maximum at 398 nm, is attained. References 8: 7 Russian, 1 Western.
[302-6900]

UDC: 621.378.5

TUNABLE FLASHLAMP-PUMPED ORGANIC DYE LASERS

Minsk ZHURNAL PRIKLADNOY SPEKTROSKOPII in Russian Vol 41, No 5, Nov 84 (manuscript received 10 Jun 83) pp 715-721

ALEKSEYEV, V.A., ZHIL'TSOV, V.I., KONSTANTINOV, B.A., NIKIFOROV, V.G. and TRINCHUK, B.F.

[Abstract] The development of laser pumping systems, optical cavities and power supplies is traced up to the creation of the LZhI laser series. The physical arrangement and parameters of the LZhI-404 - LZhI-409 laser series, which employ coaxial flashlamps, are tabulated. Work now underway to expand the range of output parameters and improve operating characteristics is described. References 17 Russian.
[6900-156]

UDC: 621.373.826.038.824

THRESHOLD CONDITIONS FOR DAMAGE TO POTASSIUM CHLORIDE SINGLE CRYSTALS EXPOSED TO CW CO_2 LASER RADIATION

Moscow KVANTOVAYA ELEKTRONIKA in Russian Vol 11, No 12, Dec 84 (manuscript received 4 Jun 84 after revision) pp 2389-2396

BLISTANOV, A.A., VOLOSHINSKAYA, N.M., GLOTOV, Ye.P., BUGAIDULLINA, Kh.Z., ZABOLOTSKIKH, I.A., KOTEROV, V.N., KUGAYENKO, O.M., SUMERIN, V.V., UL'YANOV, V.A., CHEBURKIN, N.V., SHCHERBAKOV, Yu.M., Scientific Research Center for Technological Lasers, USSR Academy of Sciences.

[Abstract] Criteria are derived for damage to laser output windows for potassium chloride due to the thermal effect of laser radiation. A definition for damage criterion based on solution to an unsteady problem of thermal elasticity is proposed. The damage characteristics for single potassium chloride crystals by continuous focused laser radiation are investigated experimentally. It is found that damage begins at the forward surface of the crystal and is caused by strong tangential stresses. A phenomenological constant is derived for this damage that can be used to design output windows for CW CO_2 lasers. This constant is an integral characteristic for an output window with a defined working surface, and can be used to calculate the maximum radiated power that can be lased through crystal windows in high power technological lasers. References 19: 12 Russian, 7 Western.
[221-6900]

UDC: 621.373.826:535.3.087

STATISTICAL SYNTHESIS OF ALGORITHMS FOR OPTIMAL PROCESSING OF AN ATMOSPHERE-DISTORTED POISSON IMAGE

Moscow KVANTOVAYA ELEKTRONIKA in Russian Vol 11, No 12, Dec 84 (manuscript received 3 Jan 84) pp 2405-2412

BAKUT, P.A., POL'SKIKH, S.D., RYAKHIN, A.D., SVIRIDOV, K.N. and USTINOV, N.D.

[Abstract] Optimal processing algorithms for a single short-exposure quantum image are synthesized on the basis of the statistical maximum likelihood criterion. Maximum likelihood equations for the spatial spectrum of an image are derived for Poisson recorded images and Gaussian atmospheric distortions. Optimal processing is found to consist of adapting the spatial spectrum of the short-exposure image in the region of low spatial frequencies, which restricts the class of observable objects to those that can be resolved well by the atmosphere-telescope system; it also reduces the amount of information about the object recovered. When the signal/noise ratio is high, it is possible to recover information about an object not resolvable by the atmosphere-telescope system, in which case optimal processing consists of a posteriori filtering of the spatial spectrum of the short exposure image. References 12: 8 Russian, 4 Western.
[221-6900]

UDC: 621.373.826.038.824

GENERATION OF FREQUENCY-TUNABLE ULTRASHORT PULSES IN A DYNAMIC DISTRIBUTED FEEDBACK LASER

Moscow KVANTOVAYA ELEKTRONIKA in Russian Vol 11, No 12, Dec 84 (manuscript received 1 Mar 84) pp 2438-2442

BEZRODNYY, V.I., ZABELLO, Ye.I. and TIKHONOV, Ye.A., Institute of Physics, Ukrainian SSR Academy of Sciences.

[Abstract] The formation of a dynamic lattice and the generation of tunable ultrashort pulses in an active medium using ultrashort pulses from a solid state laser is investigated. Dynamic distributed feedback is achieved in a Nd^{3+} :YAG laser by employing an interference circuit in which the pumping pulses are divided. The lengths of the ultrashort pulses are measured by means of an Agat-SF high speed camera. The optical system of a distributed feedback laser employing counter-propagating pumping beams is found to be suitable for ultrashort pulse lasers exhibiting lasing efficiency of approximately 3%, divergence of approximately 1 mrad with the use of a correcting lens, and a tunable range of 20 - 30 nm. References 16: 7 Russian, 9 Western.
[221-6900]

UDC: 621.373.826.038.823

RECOMBINATION IN Cu-LASER PLASMA WITH HIGH BUFFER GAS TEMPERATURE

Moscow KVANTOVAYA ELEKTRONIKA in Russian Vol 11, No 12, Dec 84 (manuscript received 11 Mar 84) pp 2471-2479

BOROVICH, B.L., NALEGATS, Ye.P., RYBIN, V.M. and YURCHENKO, N.I.

[Abstract] The manifestation and interaction of the skin effect, cathode potential drop, discharge homogeneity and stability and copper vapor confinement as volume (tube diameter) increases in a copper vapor laser are investigated. It is found that optimum buffer gas pressure should increase as the volume is increased. The diffusion cooling mechanism for electrons becomes elastic between pulses, and additional recombination processes caused by triple collisions in the plasma become significant and place an upper bound on the pressure and energy produced. The optimum gas temperature increases, and the optimum pulse repetition frequency drops. A series of experiments are described in which the medium is excited by a transverse pulse. References 29: 26 Russian, 3 Western.
[221-6900]

UDC: 621.373.826+537.531

KNIFE-EDGE DIFFRACTION FOR EXTRACTING RADIATION FROM A NONTRANSMITTING LASER CAVITY IN THE VACUUM ULTRAVIOLET

Moscow KVANTOVAYA ELEKTRONIKA in Russian Vol 11, No 12, Dec 84 (manuscript received 30 Mar 84 after revision) pp 2495-2497

PEREGUDOV, G.V. and CHIRKOV, V.A., Physics Institute imeni P.N. Lebedev, USSR Academy of Sciences.

[Abstract] A method is proposed for extracting radiation from a nontransmitting cavity using a mirror as a knife to obstruct part of the beam in the cavity. The reflecting surface of the mirror is inclined at a glancing angle of smaller that 0.1 rad to the laser beam. The radiation transmitted past the mirror edge is deflected by diffraction toward the knife, where it is reflected, strikes the reflecting surface of the knife mirror and is directed to a detector. The glancing incidence of the radiation on the reflecting surface makes it possible to reflect radiation wider by a factor of γ^{-1} than does the normal incidence on a slit mirror. An experiment on a neodymium laser indicated that a significant portion of the radiation can be extracted from the cavity. References 6 Russian.
[221-6900]

UDC: 535.21:621.373.826

THEORY OF SURFACE DAMAGE TO NONTRANSPARENT MATERIALS BY LASER RADIATION

Moscow KVANTOVAYA ELEKTRONIKA in Russian Vol 11, No 12, Dec 84 (manuscript received 28 Sep 83) pp 2397-2403

VEDENOV, A.A., IVANOV, O.P. and CHERNYAKOV, A.L.

[Abstract] The dynamics of a surface subjected to powerful laser radiation is investigated by local approximation, for which the rate of damage to the material is proportional to the density of the absorbed energy flux. An equation for the surface dynamics is derived which describes the relationship between the coefficient of absorption and the angle of incidence. The problem of determining the surface shape at different times reduces to a quadrature problem for a plane-parallel beam. The depth of the cut as a function of rate is analyzed for both polarizations; the analysis shows that the depth should be greater for longitudinal polarization. Intrinsic-mode propagation in a waveguide with low attenuation is analyzed. The relationship between the radius of the waveguide close to its input and the length of the waveguide can be described by a step function initially, and then approaches steady state values asymptotically. References 13: 11 Russian, 2 Western.
[221-6900]

UDC: 621.373.826.038.824

TRANSIENT LASING MODES IN A SYNCHRONOUSLY PUMPED DYE LASER

Moscow KVANTOVAYA ELEKTRONIKA in Russian Vol 11, No 12, Dec 84 (manuscript received 21 Feb 84) pp 2427-2431

KOVRIGIN, A.I., NEKHAYENKO, V.A., PERSHIN, S.M. and PODSHIVALOV, A.A., Moscow State University imeni N.V. Lomonosov.

[Abstract] The dynamics of mode-locking in dye lasers is investigated based on a model for a four-level active medium with unsteady polarization of the working transition. The numerical model employed is based on a system of equations obtained previously by the authors for the generated field at an arbitrary transition of the active medium output. The lasing initiation modes occurring with a continuous train of picosecond pumping pulses are calculated numerically. The results of the direct calculation for mode-locked lasing agree well with experimental findings. The proposed synchronous pumping method using trains of picosecond pulses makes it possible to obtain generated pulses shorter than the steady-state value. References 11: 2 Russian, 9 Western.
[221-6900]

UDC: 621.373.826.038.823

INVESTIGATION OF THE INFLUENCE OF PUMP PROFILING ALONG THE OPTICAL AXIS ON TELESCOPIC-CAVITY ELECTRO-IONIZATION LASER OUTPUT CHARACTERISTICS

Moscow KVANTOVAYA ELEKTRONIKA in Russian Vol 11, No 12, Dec 84 pp 2461-2464

KOZYUCHENOK, S.S., RODICHKIN, V.A., TOMASHEVICH, V.P. and SHANSKIY, V.F.

[Abstract] The effect of positioning the active medium in an unstable cavity and profiling the pumping power along the optical axis on the radiated energy of a CO_2 laser is investigated. The laser employed contained two TIR-1m intermediate amplification stages consisting of two identical modules with independent discharge. Both modules were in a common telescopic cavity with base of 3.2 meters and magnification of M = 2. It was found that when one of the modules was pumped, the efficiency with which the excitation energy was converted to radiation was higher than when the module next to the convex mirror was pumped. When both modules were pumped simultaneously, efficiency doubled to 11%. When pumping energy was fixed in one of the modules and increased in the other, radiated energy increased more rapidly than when pumping energy was constant in the first module. The experimental data agree qualitatively with the theoretical predictions. It is concluded that when several modules are employed in a common telescopic cavity, the stages with the greatest gain should be placed so that they occupy most of the volume of the amplification zone of the cavity. References 6: 4 Russian, 2 Western.
[221-6900]

UDC: 621.373.826.038.825.3

LASING CHARACTERISTICS OF A POSITIVE ELECTROOPTICAL FEEDBACK NEODYMIUM LASER

Moscow KVANTOVAYA ELEKTRONIKA in Russian Vol 11, No 12, Dec 84 (manuscript received 11 Mar 84) pp 2465-2470

AGASHKOV, A.V. and MORGUN, Yu.F., Institute of Electronics, Belorussian SSR Academy of Sciences.

[Abstract] This study investigates the lasing characteristics of a positive electrooptical feedback neodymium laser. The influence of Q-switching on the dynamics of the radiation field for ordinary Q-switching, for positive electro-optical feedback and for Q-modulation using an LiF(F_2^-) crystal shutter is studied. The experimentally observed behavior of the duration energy and repetition frequency of a giant pulse and the initial transmission of the shutter agree qualitatively with calculations based on equations for a positive electrooptical feedback laser. The use of positive electrooptical feedback makes it possible to obtain giant pulses with assigned peak power, and makes the peak pulse power independent of the power of the pumping pulse as long as the lasing threshold is exceeded for a given T_0. The radiation field was found to exhibit a filament structure because of a lengthy linear stage in the oscillation development. It is concluded that positive electro-optical feedback expands the functional capabilities of giant-pulse lasers; the relationship between output parameters and control voltages allows computer automated control of the lasers. References 9: 8 Russian, 1 Western. [221-6900]

UDC: 621.373.826

CHLORINE MONOFLUORIDE-HYDROGEN ELECTRIC DISCHARGE CHEMICAL LASER

Moscow KVANTOVAYA ELEKTRONIKA in Russian Vol 11, No 12, Dec 84 (manuscript received 9 Apr 84) pp 2507-2509

KOLOVSKIY, V.B., DROBAKHA, S.A., ZHITNEVA, G.P., ABAKUMOV, G.A., and SIMONOV, A.P., Scientific Research Physical-Chemical Institute imeni L.Ya. Karpov.

[Abstract] The lasing characteristics of a ClF-H_2-M mixture with short-pulsed initiation of chemical reactions in a transverse electrical gas discharge are investigated. Experiments were conducted on a setup incorporating a discharge chamber in an optical cavity, two pulse power sources, a synchronization unit, a gas injection and evaluation system, and a system to record the energy, pulse shape and spectral composition of the laser radiation, and to measure electrical energy in the discharge. The laser provided 60% efficiency, unit output of 4 J/l and pulse power of 0.4 MW with combined HF and HCl pulse energy of 0.16 J. The results demonstrate the possibility of using ClF-H_2-He as the active medium in a sufficiently efficient, easy to operate electric discharge

chemical laser that is discretely tunable in four regions of the near-IR band for laser chemistry and spectrascopic applications. References 5: 3 Russian, 2 Western.
[221-6900]

POSSIBILITY OF GENERATING ASYMMETRICAL PUMPING PULSES BY NONLINEAR INDUCTANCE IN A DISCHARGE LOOP CIRCUIT

Moscow AKADEMIYA NAUK SSSR, Preprint No 17, in Russian 1984.

KRUGLOV, B.V., OSETROV, V.P. and TSIGANKOV, A.A., Physics Institute imeni P.N. Lebedev.

[Abstract] The use of nonlinear inductance to generate shaped pumping pulses for solid state lasers is examined. The transient processes occurring in a discharge loop with nonlinear elements are analyzed. The requirements for magnetic materials employed as coil forms are identified. The discharge circuit of a flashlamp is modeled to check the proposed analytical relationships. It is shown possible to create real flashlamp supply circuits using a shaped current pulse with a steep leading edge. This makes it possible to lengthen the service life of the lamps and use the energy for pumping. However, the proposed approach is cumbersome in that magnetically hard materials must be used, or the nonlinear inductance core must be large; and the core must be degaussed after each pulse. References 10: 8 Russian, 2 Western.
[335-6900]

LASER CAVITIES WITH DIFFRACTION GRATINGS IN AUTOCOLLIMATION MODE

Moscow AKADEMIYA NAUK SSSR Preprint No 37 in Russian 1984.

BEL'TYUGOV, V.N., OCHKIN, V.N., SOBOLEV, N.N., TROITSKIY, Yu.V. and UDALOV, Yu.B., Physics Institute imeni P.N. Lebedev, USSR Academy of Sciences.

[Abstract] Frequency-selective losses in laser cavities with circular apertures containing diffraction gratings are investigated experimentally and theoretically. A cavity incorporating a tilted-plane mirror used to compute the frequency-selective loss function is described. Calculations for a wide range of cavity parameters make it possible to apply the findings to IR lasers, for which the region of confocality and Fresnel number of parameters employed is characteristic. CO_2 laser experiments confirm the findings. The influence of radial inhomogeneity of the active medium is found to consist primarily of changes in the amount of nonselective losses as compared with a hollow cavity. Selective losses remain practically unchanged. The influence of the beam spreader on the selectivity of a diffraction-grating cavity is demonstrated quantitatively. The selectivity is found to be insufficient in certain cases for realizing an amplification zone above the threshold, even for comparatively low-pressure lasers. References 20: 11 Russian, 9 Western.
[335-6900]

POLARIZATION CHARACTERISTICS OF A SECONDARY GAMMA-RAY DURING LIGHT SCATTERING BY RELATIVISTIC ELECTRONS

Moscow AKADEMIYA NAUK SSSR Preprint No 307 in Russian 1983.

MURASHOVA, V.A., PASHCHENKO, G.S. and YAKIMENKO, M.N., Physics Institute imeni P.N. Lebedev, USSR Academy of Sciences.

[Abstract] The polarization characteristics of a gamma-beam in near-perpendicular interaction geometry are investigated as an extension of a group of studies on ruby laser photon scattering by relativistic electrons of the internal beam of the FIAN S-60 synchrotron. A theoretical anslysis of the polarization is presented. The direction and degree of polarization of gamma-radiation is determined experimentally by exploiting the relationship between the scattering cross-section of polarized gamma-quanta on the resting electrons of the detector material and the angle between the scattering plane and the polarization vector. Measurement of the amplitude and energy spectra are described. The experimental findings provide good qualitative confirmation of the predicted high degree of polarization of the secondary gamma-beam caused by interaction between polarized photons and unpolarized relativistic electrons in the perpendicular geometry. It is demonstrated possible to create quasi-monochromatic gamma-beams with the required polarization characteristics that are suitable for physical research if special steps are taken to align the interacting beams and to ensure that the laser can produce pulse energy of at least 10J over long periods. References 17: 10 Russian, 7 Western.
[335-6900]

UDC: 621.378.325

PHYSICAL FACTORS LIMITING SERVICE LIFE OF COPPER BROMIDE LASERS

Moscow AKADEMIYA NAUK SSSR INSTITUT OBSHCHEY FIZIKI. DISSERTATION ABSTRACTS, in Russian.

VUCHKOV, Nikolay Kirilov, Institute of General Physics, USSR Academy of Sciences.

[Abstract] The factors determining the service life of copper bromide lasers are investigated. Six different designs of gas discharge tubes for halogen-vapor lasers are developed and tested, each with different placement of the working substance, with or without discharges on limiters, and with differing electrode construction. The nature of the discharge and lasing behavior are studied, and the basic lasing characteristics are measured as a function of the laser operating conditions. Optimum working conditions for the discharge tubes are identified. The behavior of the yellow and green lines is investigated as a function of the working conditions of the copper bromide laser. It is found that the main cause for the gradual reduction in laser output power over a time is contamination of the discharge tube output windows.
References 5 Russian.
[333-6900]

UDC: 537.84

EXPERIMENTAL INVESTIGATION OF ENERGY DISSIPATION IN MAGNETIC LIQUID CONTAINED IN ROTATING MAGNETIC FIELD

Riga MAGNITNAYA GIDRODINAMIKA in Russian No 3, Jul-Sep 84 (manuscript received 11 Oct 83) pp 28-32

KRONKALNS, G.Ye. and MAYOROV, M.M.

[Abstract] The release of heat in a magnetic liquid is investigated for different intensities and frequencies of rotation of a homogeneous magnetic field in specimens with differing concentration and composition of the magnetic phase. A magnetic liquid consisting of a colloidal solution of magnetite in kerosene was investigated in an experimental setup consisting of a cylindrical vessel 10 mm in diameter placed in the center of the bipolar inductor of a rotating magnetic field. A bifilar heater was placed in the liquid to determine the heat capacity of the system. It was found that heat release in a concentrated magnetic liquid is quite high when an alternating field is present. The permeance of the field within the specimen was significantly weaker than the field created by the inductor. It was established that heat release in the magnetic liquid caused by an alternating field can be significant when the form of the magnetic liquid has an insignificant demagnetization factor, or when a closed magnetic system is employed. References 13: 12 Russian, 1 Western. [141-6900]

UDC: 532.517.4:537.84

TWO-DIMENSIONAL MHD-TURBULENCE: HIERARCHICAL MODEL

Riga MAGNITNAYA GIDRODINAMIKA in Russian No 3, Jul-Sep 84 pp 48-54

FRIK, P.G.

[Abstract] A hierarchical model of two-dimensional turbulence is extended to the case of MHD and is used to model cascade processes in two-dimensional MHD-turbulence over a wide range of wave numbers ($K_{max}/K_{min} > 10^5$). MHD currents are examined in which the velocity and magnetic field have only two components $V = (V_x, V_y\ 0)$, $B = (B_x, B_y, 0)$, and are independent of the z

coordinate; the eddying, electrical current and vector potential, accordingly, have only the z-component. The fundamental stages in the construction of the hierarchical model are outlined, with references to sources containing a complete description of the construction of the model for ordinary two-dimensional turbulence. The hierarchical model is found to be comparatively effective for modeling cascade processes in complex turbulent flows. A wide range of wave numbers can be investigated with insignificant expenditure of machine time: the typical calculation time on a BESM-6 computer was ten minutes. The model confirmed that the spectral behavior is significantly noisier than for ordinary turbulence, that there is a significant reverse flux of the square of the vector potential, that the maximum scales of the magnetic field developed very slowly, and that the magnetic field cannot be maintained without direct input of magnetic energy. The spectra of developed MHD turbulence are found to vary significantly, and a strong relationship is found between the initial conditions and the method by which energy is injected. References 7: 2 Russian, 5 Western.
[141-6900]

UDC: 537.84

UNSTEADY MHD FLOW IN ANNULAR CHANNEL OF A RADIAL MAGNETIC FIELD

Riga MAGNITNAYA GIDRODINAMIKA in Russian No 3, Jul-Sep 84 (manuscript received 11 Feb 84) pp 76-78

ANTIMIROV, M.Ya. and KOLYSHKIN, A.A.

[Abstract] The problem of an unsteady MHD flow in an annular channel of a radial magnetic field described by the equation $B^e = \{B_0 \frac{R_1}{r}, 0, 0\}$ is investigated, assuming that the magnetic Prandtl number $P_{r_p} = 0$. The flow of conducting liquid which is fully developed in the direction of the z-axis is investigated in the region $R_1 < r < R_2$, $0 < \phi < 2\pi$, $-\infty < z < +\infty$ in the above field with an assigned constant pressure gradient. The problem is stated mathematically in dimensionless quantities (characteristic dimensions of length, time, velocity, magnetic field and pressure), and is solved by applying the residue theorem. The velocity distribution is plotted for various values of time with different values of the Hartman number HQ. The magnetic field is found to suppress movement and to reduce the rise time (i.e., the amount of time required to achieve the steady state). The rise time is plotted as a function of the Hartman number, indicating that the rise time for Ha = 4 is smaller by a factor of 3 than for Ha = 0. The steady state velocity distribution is plotted for different values of the Hartman number. References 3 Russian.
[141-6900]

UDC: 621.313.53

ALLOWANCE FOR LIQUID VISCOSITY AND HIGHER SPATIAL HARMONICS OF A MAGNETIC FIELD IN ANALYZING VELOCITY DISTRIBUTION FOR MHD INDUCTION PUMPS

Riga MAGNITNAYA GIDRODINAMIKA in Russian No 3, Jul-Sep 84 (manuscript received 2 Jan 84) pp 111-118

KRUSHBERG, R.R.

[Abstract] The magnetic field distribution along the inductor in the nonmagnetized gap of an induction pump is analyzed. It is assumed that the liquid flows in parallel layers with the velocity in each section of the layer having the same direction and magnitude: transverse velocity components are disregarded. The velocity of each layer is found based on equilibrium of the forces acting upon the layer in question. A model is developed with a velocity distribution across the channel with allowance for viscosity of the liquid. The calculated velocity distribution is compared with experimental data considering the higher spatial harmonics of the magnetic field and the viscosity of the liquid. Viscosity is found to have the greatest influence along the edges of the channel, where the largest velocity gradient is found. References 14 Russian.
[141-6900]

UDC: 621.313.53

INFLUENCE OF LONGITUDINAL BOUNDARY EFFECT ON INTEGRAL CHARACTERISTICS OF LINEAR INDUCTION MHD MACHINES

Riga MAGNITNAYA GIDRODINAMIKA in Russian No 3, Jul-Sep 84 (manuscript received 28 Mar 83) pp 119-127

SIPLIVYY, B.N. and TOLMACH, I.M.

[Abstract] The influence of the longitudinal boundary effect on the characteristics of linear MHD machines is investigated in electrodynamic approximation with the help of an algorithm developed by the authors. The behavior of the longitudinal boundary effect coefficient is investigated for various magnetic Reynolds numbers and different numbers of poles. It is found analytically that the stresses for a Parts-Vethokhin winding scheme are greater than for the Vol'dek winding scheme. References 6 Russian.
[141-6900]

UDC: 537.525.72

PLASMA CONFINEMENT IN L-2 STELLARATOR WITH OHMIC HEATING

Moscow FIZIKA PLAZMY in Russian Vol 11, No 1, Jan 85 (manuscript received 7 Jun 84) pp 13-23

SHPIGEL', I.S., Institute of General Physics, USSR Academy of Sciences.

[Abstract] This paper reviews the results of investigations of ohmic plasma heating in the L-2 stellarator. It is found that the vacuum structure of the magnetic field ensures plasma equilibrium in the stellarator. MHD activity occurring in the central portion of the filament has a strong influence on the energy balance in that region. The structure of the MHD oscillations of the plasma in the internal region, and its relationship with the radius of the plasma filament, are established. The primary impurity in the discharges which are investigated is oxygen, which determines the observed volumetric energy losses, the quantity of Z_{eff}, and their radial distributions. No coronal equilibrium was observed experimentally in the plasma, apparently because of the short discharge duration and the small transverse dimension of the plasma filament. The distribution of the ion temperature along the radius, which is asymmetrical because of ion drift in the inhomogeneous magnetic field, is determined through energy analysis of the atom stream.
References 32: 30 Russian, 2 Western.
[253-6900]

NUCLEAR PHYSICS

SEPARATION OF ^{238}U AND ^{237}Np NUCLEI BY GAMMA-QUANTA INTERMEDIATE ENERGIES

Moscow PISMA V ZHURNAL EKSPERIMENTAL'NOY I TEORETICHESKOY FIZIKI in Russian Vol 40, No 10, 25 Nov 84 (manuscript received 10 Oct 84) pp 445-447

KAZAKOV, A.A.; KEZERASHVILI, G.Ya.; LAZAREVA, T.Ye.; NEDOREZOV, V.G.; SKRINSKIY, A.N.; SUDOV, A.S.; TUMAYKIN, G.M. and SHATUNOV, Yu.M., Institute of Nuclear Research, USSR Academy of Sciences, Institute of Nuclear Physics, Siberian Department, USSR Academy of Sciences.

[Abstract] A system employing a beam of back-scattered Compton quanta based on the e^+e^--accumulating complex and an LTI-701 solid state laser is employed to measure the average photo-separation and separability cross sections of ^{238}U and ^{237}Np nuclei at energies ranging from 150 to 170 MeV. The findings contradict the predictions of existing models based on photon-meson nuclear excitation, and suggest that one of the most probable mechanisms underlying the excitation of nuclei by gamma-quanta with intermediate energies, in addition to the photogeneration of pions, is the generation of e^+-e^--pairs in the field of the nucleus: the gamma-quantum wavelength energies in this region becomes comparable to the nucleon dimension, so that collective nuclear excitations are generally suppressed. References 7: 4 Russian, 3 Western. [6900-155]

UDC: 551.23:539.103

NEUTRON DISTRIBUTION OF A CALIFORNIUM SOURCE IN A MEDIUM SURROUNDED BY REFLECTORS

Tashkent IZVESTIYA AKADEMII NAUK UZ SSR. SERIYA FIZIKO-MATEMATICHESKIKH NAUK No 1, Jan-Feb 85 (manuscript received 26 Mar 82) pp 65-68

SAYDMURADOV, T., KIST, A.A. and KHATAMOV, Sh., Samarkand State Pedagogical Institute imeni S. Ayni.

[Abstract] The possibility of increasing efficiency by using different combinations of absorbers, retarders, and reflectors in californium-252 based neutron sources is investigated. The neutron distribution is measured by foil activation. The activation effect was found to be greatest when water was

used as a buffer. Systems were selected to increase element selectivity by the activation method and gamma-spectroscopy by measuring the cadmium ratio of a number of elements. The results are used in a configuration selection and in developing an activation analysis system which improves geometric radiation factors and measures the induced activity by gamma-spectroscopy. References 7: 5 Russian, 2 Western.
[372-6900]

UDC: 537.3

MAGNETIC PROTECTION AGAINST PROTON AND ELECTRON STREAMS

Tbilisi SOOBSHCHENIYA AKADEMII NAUK GRUZINSKOY SSR in Russian Vol 115, No 3, Sep 84 (manuscript received 20 Jun 84) pp 529-531

ZHGENTI, T.G., Tbilisi State University.

[Abstract] This study investigates the earth's radiation belts as a probablistic protective system against proton and electron streams. The atmosphere is stated to perform two functions with respect to the biological world: it serves as a reliable protective system against radiation in a particular electromagnetic waveband, and against corpuscular effects; weak low frequency electromagnetic fields serve as a carrier of mechanical energy for living cells. References 8 Russian.
[254-6900]

MULTIPLICITY OF CHARGED PARTICLES IN K^+p INTERACTIONS AT 70GeV/sec

Moscow YADERNAYA FIZIKA in Russian Vol 41, No 1, Jan 85 (manuscript received 11 Mar 84) pp 101-104

GRITSAYENKO, I.A., RON'ZHIN, V.M., FENYUK, A.B. and SHLYAPINKOV, P.V., Institute of High Energy Physics, Serpukhov.

[Abstract] This study presents findings on the multiplicity of charged particles in K^+p-interactions at 70 GeV/sec obtained experimentally in a hydrogen bubble chamber irradiated by a beam of K^+ mesons from the CERN accelerator. The findings are compared with those from other K^+p experiments for beams ranging from 3 - 250 GeV/sec. References 12: 3 Russian, 9 Western.
[248-6900]

NEAR-RESONANCE EFFECTS OF WEAK NEUTRAL CURRENTS OF ELECTRONS AND NEW QUARKS DURING ELASTIC $e\bar{e}$-ANNIHILATION

Moscow YADERNAYA FIZIKA in Russian Vol 41, No 1, Jan 85 (manuscript received 21 Feb 84) pp 170-176

PANKOV, A.A. and SATSUNKEVICH, I.S., Institute of Physics, Belorussian SSR Academy of Sciences.

[Abstract] The influence of a weak neutral current of electrons and new quarks on the differential scattering cross-section of the process $ee \rightarrow e\bar{e}$ is analyzed. The contribution of weak neutral currents to the differential scattering cross-section of unpolarized initial beams is analyzed. Regions of the kinematic variables are found, within which the near-resonance contribution of weak neutral currents dominates the non-resonant contributions. Near-resonance weak neutral current effects on the $ee \rightarrow e\bar{e}$ process can not be simulated by purely electromagnetic higher-order effects; making allowance for radiation corrections to the resonance effects in question brings about no essential quantitative or qualitative changes in their energy behavior. References 13: 5 Russian, 8 Western.
[248-6900]

MOMENTS OF MULTIPLICITY DISTRIBUTIONS OF SECONDARY CHARGED PARTICLES IN PROTON-NUCLEUS AND NUCLEUS-NUCLEUS COLLISIONS

Moscow YADERNAYA FIZIKA in Russian Vol 41, No 1, Jan 85 (manuscript received 20 Feb 84) pp 236-243

KUTSIDI, N.K. and TEVZADZE, Yu.V., Institute of High Energy Physics, Tbilisi State University.

[Abstract] Multiplicity distributions are analyzed in detail for various secondary particles formed during collisions of relativistic nuclei. The results are based on data obtained when exposing a two-meter propane bubble chamber to beams of protons with primary pulses of 2.3, 4.2, 5.4 and 9.9 GeV/sec and beams of relativistic deuterium, helium (with p_0 = 2.3, 4.2 and 5.1 GeV/sec · nucleon) and carbon (with p_0 = 2.3 and 4.2 GeV/sec · nucleon) nuclei. The moments of the distributions and their correlations are reproduced well in the models of successive collisions of nucleons from interacting nuclei, while in a similar analysis of mulitiplicity distributions no effects from collective interaction of nucleons were manifested. References 19: 9 Russian, 10 Western.
[248-6900]

UDC: 535.36

SELECTION OF GEOMETRIC CONDITIONS FOR MEASURING PARAMETERS OF RELATIVISTIC ELECTRON BEAMS BY LIGHT SCATTERING

Minsk ZHURNAL PRIKLADNOY SPEKTROSKOPII in Russian Vol 41, No 5, Nov 84 (manuscript received 28 Jun 83) pp 860-862

ZHURAVLEV, V.A., KARPOV, O.V., MUZALEVSKIY, V.Ye., and PETROV, G.D.

[Abstract] A graphic method is described for determining the boundaries of the scattered radiation spectrum and the optimum experiment geometry based on assumed relativistic electron beam parameters. An equation is derived whose zeros are the minimum and maximum frequencies between which radiation is scattered on the beam. References 2 Russian.
[6900-156]

UDC 528.061.2

METEOROLOGICAL CORRECTION TO REFRACTION OF OPTICAL WAVE BEAMS

Tomsk IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: FIZIKA in Russian No 8, Aug 85 (manuscript received 27 Jul 84) pp 51-56

LUKIN, V.P., MELAMUD, A.E. and MIRONOV, V.L., Institute of Atmospheric Optics, Siberian Department, USSR Academy of Sciences

[Abstract] For reducing the error of laser reference systems used in geodetic surveys, the main source of error being fluctuations of the laser beam axis owing to variations of atmospheric refraction along the propagation path, a correction algorithm is proposed which involves calculating the axis displacements in variously stratified air on the basis of meteorological data, rather than tracking the instantaneous positions of special reference sources. Displacement of the center of gravity of the beam cross-section is defined as the sum of a regular component and a random component, the latter having a zero mean value and some dispersion. This displacement is also $r = 7.86 \cdot 10^{-8} KL^2$ m (K- terrestrial refractive index, L- range in m), while the regular refraction angle is $z_r = 0.93KD$ ang. min (D- distance in km), with the terrestrial

refractive index being a linear function of the altitudinal temperature gradient K= 5.93(0.0342+ dT/dz). This relation characterizes its dependence on the meteorological conditions in terms of a single variable. The displacement of the laser beam axis thus also becomes a linear function of the altitudinal temperature gradient. Using the Richardson parameter as a stability criterion for the atmospheric surface layer, the temperature gradient is evaluated for winds causing three possible classes of air stratification: 1) stable; 2) neutral; 3) labile. The results of calculations according to this algorithm are compared with experimental data on a laser beam with light on the 0.6328 μm wavelength propagating parallel to the ground, nominally 1.5 m above it. The altitude of the beam axis was measured at the source and at receiver ends 500, 1000, 1500, 2000 m from it along the propagation path, while the air temperature at these points was simultaneously measured according to standard procedure. The comparison reveals that at 500 m the correlation between measurable air temperature and displacement of the laser beam axis is strong in an atmosphere with labile stratification (summer day) but weak in an atmosphere with neutral or stable stratification, evidently owing to measurement inaccuracy. The correlation is also weak at 1000 m and 1500 m in an atmosphere with any stratification, evidently owing to "saturation" of laser beam axis fluctuations, but becomes strong again at 2000 m. Refinement of the correction algorithm is therefore needed, especially for the intermediate range, the random component of atmospheric refraction being the main source of its inaccuracy. The method is basically sound, however, and can be aid in the design of laser reference systems for use in specific climatic regions. Figures 1; references 10: 8 Russian, 2 Western.
[55-2415]

ASYMPTOTIC STABILITY OF SELF-SIMILAR SOLUTIONS MANIFOLD WITH SELF-FOCUSING

Moscow ZHURNAL EKSPERIMENTAL'NOY I TEORETICHESKOY FIZIKI in Russian Vol 88, No 2, Feb 85 (manuscript received 4 Jul 84) pp 390-400

FRAYMAN, G.M., Institute of Applied Physics, USSR Academy of Sciences.

[Abstract] The dynamics of quasi-optical beam self-focusing is investigated analytically on the basis of a nonlinear Schroedinger equation. The manifold of self-similar solutions to the nonlinear Schroedinger equation is shown to be asymptotically stable, in that the influx of energy to the singularity is equal to the critical value. A procedure is proposed for deriving a system of equations that is equivalent to the nonlinear Schroedinger equation and that explicitly describes the focused and unfocused components of the beam field. References 3: 1 Russian, 2 Western.
[246-6900]

ADAPTIVE OPTICS ELEMENTS FOR LASER DISPERSION CAVITIES

Leningrad PIS'MA V ZHURNAL TEKHNICHESKOY FIZIKI in Russian, Vol 11, No 3, 12 Feb 85 (manuscript received 9 Aug 84) pp 161-190

KRAVCHENKO, V.I., LEVCHYENKO, Ye.G. and SOKOLOV, V.A., Institute of Physics, Ukrainian SSR Academy of Sciences

[Abstract] The possibility of using adaptive laser cavity optical elements for spectral selection of stimulated emission is investigated. Using the example of a composite diffraction grating, the properties of such elements that govern the spectral characteristics of laser beams are analyzed. Cavity tuning incorporating an adaptive dispersion element is described. A spectral tuning step of approximately $2 \cdot 10^{-3}$ nm is estimated for a wavelength of 0.5 μm for specified dispersion element dimensions. References: 4 Russian. [302-6900]

PHOTO MATERIALS AS SOFT X-RADIATION DETECTORS FOR HIGH TEMPERATURE PLASMA

Moscow AKADEMIYA NAUK SSSR Preprint No 64 in Russian 1984.

BLEKHMAN, B.A., GALICHIY, A.A., KALASHINKOV, M.L., MALEYEV, A.M., MIKHAYLOV, Yu.A., RODE, A.V., SKLIZKOV, G.V., FEDOTOV, S.I. and SHPOL'SKIY, M.R., Physics Institute imeni P.N. Lebedev, USSR Academy of Sciences.

[Abstract] Soviet-produced sensitometric, structurometric and data-recording photomaterials employed for recording soft X-radiation of laser plasma are investigated. The soft X-radiation source employed consisted of laser plasma produced by focusing laser radiation on a massive flat aluminum target in a vacuum chamber. Types UF-VR-2, UFSh-4 and UF-4 film were considered. The linear portion of the characteristic curve for these materials was found to extend to optical densities of approximately 6, and UF-VR-2 and UFSh-4 films were found to provide better than 30% quantum detection efficiency. The choice of photographic material was found to have a strong influence on the amount of information extracted; and the information derived can be used to optimize the choice of material. References 31: 12 Russian, 19 Western. [335-6900]

APPLICATION OF SCINTALLATION DETECTORS FOR X-RAY DIAGNOSIS OF LASER PLASMA

Moscow AKADEMIYA NAUK SSSR, Preprint No 26 in Russian, 1984.

KALASHNIKOV, M.P., LYAPIDEVSKIY, V.K., MIKHAYLOV, Yu.A., PRORVICH, V.A., RODE, A.V., SARTORI, A.V., SKILZKOV, G.V. and FEDOTOV, S.I., Physics Institute imeni P.N. Lebedev, USSR Academy of Sciences.

[Abstract] Scintallation detectors designed to register laser plasma X-radiation in the 2-200 keV range are investigated. The filter method is employed, in which the spectral characteristics are a function of the thickness of the filters and the substance used to make them. The X-radiation energies caught by different filters are determined experimentally and used to recover the spectrum. The light yield of surface layers 0.01-20 microns deep is measured. The unit light yield is determined as a function of the absorbed energy density in the 10^{17} - 10^{21} eV/cm^3 range, and of the quantum energy for CsJ(Tl) crystals (2.6-17.4 keV). The use of scintillation detectors for laser plasma X-radiation diagnosis is described. The unit light yield of crystals in the shift X-radiation region is investigated. Measurements of the relationship between the intensity of X-radiation and the atomic number of the target in different spectral bands indicates that the distribution of hard quanta is not temperature-dependent in the 10-100 keV region. Registration of relativistic electrons is analyzed in detail; because of their small number, these electrons play an insignificant role in the experiments described. References 46: 32 Russian, 14 Western.
[335-6900]

INFLUENCE OF PERTURBATIONS ON THE SPECTRA OF POLARITON RAMAN SCATTERING OF LIGHT IN NONLINEAR CRYSTALS

Moscow AKADEMIYA NAUK SSSR, Preprint No 6 in Russian, 1984.

GORELIK, V.S., REZNIK, L.G. and UMAROV, V.S., Physics Institute, USSR Academy of Sciences imeni P.N. Lebedev.

[Abstract] The influence of temperature, electrical field and impurity perturbations on the optical and dielectric parameters of nonlinear crystals was examined by polariton Raman scattering of light. The polariton spectra were photographed. The perturbations were effected in the crystals by means of devices developed especially to study crystals under equilibrium and non-equilibrium temperature variation in strong electrical fields with uniaxial pressure. It was found that the effect of internal and external perturbations on the crystals changes the nature of the polariton spectra of Raman scattered light. The perturbation effect is greatest for the shift of maximum scattering wavelength on high frequency E-polaritons. The greatest changes are caused by such perturbations as temperature variations, laser radiation and doping. Behavior at maximum wavelengths of polariton scattering may be used to estimate the values of these perturbations.
[335-6900]

UDC: 621.373.826

LASER RADIATION WAVEFRONT REVERSAL WITH INTERMEDIATE FREQUENCY CONVERSION TO ANOTHER BAND

Moscow KVANTOVAYA ELEKTRONIKA in Russian Vol 11, No 12, Dec 84 (manuscript received 26 Mar 84) pp 2505-2507

BESPALOV, V.I., DVORETSKIY, M.A., KISELEV, A.M. and PASMANIK, G.A., Institute of Applied Physics, USSR Academy of Sciences.

[Abstract] A laser radiation wavefront reversal method is proposed and implemented experimentally in which the input signal is mixed parametrically with one or several reference wavelengths and translated to a different (intermediate) frequency band where the reversal is performed. Upon passing back through the parametric mixer, the conjugated intermediate-frequency signal, together with the conjugated reference wave, produces radiation at the frequency of the input signal. In the experimental setup, light at $\lambda = 0.5\,\mu m$ is conjugated by converting it to $\lambda = 1.06$ m. Neodymium laser radiation was split into two beams, one of which was directed to a KDP crystal, where its frequency was doubled and wavefront reversal performed. After passing through a cuvette containing $CuSO_4$ (which cut off radiation at the fundamental frequency) and plane-parallel plates (that reflect part of the radiation in order to record the angular spectrum and second-harmonic energy), the light beam struck a parametric mixer where it combined with the reference wave. The reference wave or second beam ($\lambda = 1.06\,\mu m$) was directed to the same parametric amplifier by a mirror. The findings indicate that parametric frequency mixers can be used effectively for wavefront conjugation of optical signals. The accuracy of the proposed method depends on the characteristics of the parametric mixer, the accuracy of the reference waves wavefront conjugation and the radiation at the intermediate frequency. References 2 Russian. [221-6900]

UDC: 621.373.826

LOW THRESHOLD OPTICAL DISCHARGE IN AN AERODISPERSED MEDIUM

Moscow KVANTOVAYA ELEKTRONIKA in Russian Vol 11, No 12, Dec 84 (manuscript received 7 Mar 84) pp 2487-2492

ZAKHARCHENKO, S.V., SEMENOV, L.P. and SKRIPKIN, A.M., Institute of Experimental Meteorology, Oblinsk.

[Abstract] The conditions for low threshold collective optical discharge in an aerosol medium at laser intensities of approximately 1 - 10 MW/cm^2 ($\lambda = 1.06\,\mu m$) is investigated in order to determine the collective influence of multiple aerosol particles. A commercial GOS-1001 Nd Laser in free lasing mode was employed as the source. The laser radiation was focused in an aerosol stream of corundum particles (formed by an aerosol generator), whose size and concentration were measured by means of a television counter. The glow

dynamics of the aerodispersed medium was investigated using an SFR-1 high speed camera. Three stages are marked in the evolution of a laser spark. In the first stage, plasma is generated near the aerosol particles and discrete, glowing, microscopic clouds are formed, which grow and merge into a unified macroscopic site. The macroscopic site expands in the second stage; the third stage of the evolution of the optical discharge is the plasma dissipation stage, which begins after the laser pulse is over. Optical discharge initiation in the entire focal region of laser radiation at I = 1 - 10 MW/cm^2 is associated with the occurrence of microscopic clouds at numerous aerosol particles which grow and merge into a unified plasma cloud. The development of a low threshold optical discharge in an aerosol medium requires the presence of numerous solid particles in the region where the laser radiation interacts with the aerosol. The low threshold optical discharge mode is apparently the lowest-threshold mode for laser spark initiation in aerodispersed media. References 11: 10 Russian, 1 Western.
[221-6900]

UDC: 621.373.826:681.7.068.4

INFLUENCE OF LASER RADIATION ON INDUCED ABSORPTION SPECTRA OF PURE QUARTZ GLASS OPTICAL FIBERS

Moscow KVANTOVAYA ELEKTRONIKA in Russian Vol 11, No 12, Dec 84 (manuscript received 12 Mar 84 after revision) pp 2480-2486

DIANOV, Ye.M., KARPECHEV, V.N., KORNIYENKO, L.S., RYBALTOVSKIY, A.O. and CHERNOV, P.V., Institute of General Physics, USSR Academy of Sciences.

[Abstract] The influence of laser radiation on radiation color centers and their associated induced absorption in the spectra of irradiated glass optical fibers is investigated. The glass fiber specimens employed had 40 - 50 μm diameter cores made of dry pure quartz glass. The optical fibers were 6 - 20 meters long, produced by chemical precipitation from the gaseous phase and clad with reflecting borosilicate glass. Spectral measurements of the induced absorption in the UV region were made using an FEU-71 photodetector and a sounding radiation source. The stimulated laser emission power in the cross section of the optical fiber was measured by a photodiode; the absorption spectra were recorded by the fragment method. The induced absorption spectra of specimens irradiated with different doses at 77 and 300 K indicate that increasing the dose from 300 to 10^4 rad at 77 K produces no qualitative change in the absorption spectra, and causes only a monotonic growth in the induced absorption throughout the spectral range. At 300 K an induced absorption band with maximum at 670 nm appears after irradiation with a dose of 10^4 rad. Eight different types of color centers were isolated whose bands cover practically the entire observed absorption spectra. The connection found between color centers and a 340-nm absorption band, and color centers with absorption in the IR band, indicate that absorption in the UV band can have a significant influence on the amount of induced absorption in the IR band. References 5: 4 Russian, 1 Western.
[221-6900]

UDC: 535.211:536.4

PHASE TRANSITION KINETCIS DURING LASER VAPORIZATION OF METAL

Moscow KVANTOVAYA ELEKTRONIKA in Russian Vol 11, No 12, Dec 84 (manuscript received 21 Feb 84) pp 2432-2437

MAZHUKIN, V.I. and SAMOKHIN, A.A., Institute of General Physics, USSR Academy of Sciences.

[Abstract] The behavior of the Mach number during plasma-free laser vaporization of metal is investigated for various temperatures of the irradiated surface. The analysis is based on numerical solution of the heat conductivity equation for a condensed medium in conjunction with gas dynamic equations for vapor, with allowance for additional functions on the irradiated surface which determine the kinetics of the nonequilibrium phase transition. The results of the numerical modeling indicate a nontrivial region in which an unsteady vaporization process with constant Mach number M = 1 depends strongly upon laser radiation conditions. As the radiation becomes stronger, plasma formation in the stream of vaporized material must be taken into account. References 27: 21 Russian, 6 Western.
[221-6900]

UDC: 621.375.8.038.825.3:681.7.068

LIGHT PULSE COMPRESSION IN A FIBER GLASS AMPLIFIER

Moscow KVANTOVAYA ELEKTRONIKA in Russian Vol 11, No 12, Dec 84 (manuscript received 25 Apr 84) pp 2510-2512

DZHIBLADZE, M.I. and ERIKASHVILI, R.R., Tbilisi State University.

[Abstract] The propagation of light pulses through active neodymium glass fibers is investigated experimentally. It is found that the duration of amplified pulses is cut nearly in half when passed through a fiber 1 meter long. The mechanism underlying this compression is bleaching of short-lived color centers that arise as a result of the violet portion of the pumping spectrum. Bleaching is determined experimentally to be the result of recombination of short-lived color centers, rather than saturation of transitions between levels. Experimentally observed results on light pulse compression for different excitation levels are plotted. References 6 Russian.
[221-6900]

ANALYSIS AND INVESTIGATION OF A COHERENT WAVEFIELD IN THE FOCAL REGION OF RADIAL-SYMMETRIC OPTICAL ELEMENTS

Moscow AKADEMIYA NAUK SSSR Preprint No 304 in Russian, 1983.

VASIN, A.G., GOLYO, M.A., DANILOV, V.A., KAZANSKIY, N.L., KARPEYEV, S.V., SISAKYAN, I.N., SOYFER, V.A. and UVAROV, G.V., Physics Institute imeni P.N. Lebedev, USSR Academy of Sciences.

[Abstract] A method is proposed for calculating the coherent wavefield in the focal region of computer-simulated radial-symmetric optical elements. This study investigates the problem of defining the area of applicability of geometric optics in design focusers, as well as the influence of digitization errors on the functioning of artificial optical elements. Computation of the three-dimensional intensity distribution of focused radiation in the focal region using wave theory is examined for the case of radial-symmetric optical elements. An algorithm and program are described for calculating the light field in the focal region of the focuser. The results of computer calculations are outlined. The experimental investigation of a focuser in a thin cylinder is described. The calculated light intensity distributions in the cross-sections of the focal region agree with the experimental investigation of the laser radiation focuser in a thin cylinder. The methods can be used effectively for computer modeling of the laser radiation focused by a synthetic radial-symmetric optical element. References 15 Russian.
[335-6900]

UDC: 535.337 + 621.3.038.82

THE FORM AND WIDTH OF R-LINES AND PARAMAGNETIC RESONANCE LINES FOR RUBY

Moscow AKADEMIYA NAUK SSSR INSTITUT OBSHCHEY FIZIKI. DISSERTATION ABSTRACTS, in Russian.

GVALADZE, Tengiz Varlamovich, Institute of General Physics, USSR Academy of Sciences.

[Abstract] The profile of the R-lines and electron paramagnetic resonance lines for ruby is investigated; the role of different factors influencing the shape, width, and absorption integral of these lines is explained. A method is developed for assessing the contribution of different broadening mechanisms to the observed line width. The absorption integral of the R_1- and R_2-lines of ruby is found to remain practically unchanged at temperatures ranging from 16 to 95°C. A formula is proposed that relates the coefficient of absorption of the R-lines to the concentration of chromium ions. Using numerical methods and a program to minimize a function of many variables, a method is developed for identifying the contribution of different broadening mechanisms to the observed line width according to the characteristic angular relationships of the individual mechanisms. References 7: 3 Russian, 4 Western.
[333-6900]

CORRELATION PROPERTIES OF OPTICAL FIELDS

Moscow AKADEMIYA NAUK SSSR, INSTITUT OBSHCHEY FIZIKI, LABORATORIYA VOLNOVYKH YAVLENIY, Preprint No 149 in Russian, 1984 (signed to press 12 Jun 84)

VYKOV, V.P. and SHEPELEV, G.V., Institute of General Physics, USSR Academy of Sciences.

[Abstract] This study describes interference experiments in classical and quantum electrodynamics. Different methods are discussed for statistical processing of measurement results, as well as the relationship between statistical processing and quantum mechanical averaging. The influence of the quantum state of the electromagnetic field on the interference result is examined. Fourth-order interference experiments are discussed. It is found that the results of interference experiments with independent beams depend upon the quantum mechanical state of the electromagnetic field, which allows such experiments to be used to investigate the state of the field. Experiments on fourth-order coherence are found to differ qualitatively from second-order experiments, and provide additional information on the quantum mechanical state of the investigated field. References 11: 6 Russian, 5 Western.
[311-6900]

UDC: 621.378.325

IMAGE BRIGHTNESS AMPLIFIERS IN PROJECTION OPTICS SYSTEMS

Moscow AKADEMIYA NAUK SSSR INSTITUT OBSHCHEY FIZIKI. DISSERTATION ABSTRACTS, in Russian.

ZEMSKOV, Constantin Ivanovich, Institute of General Physics, USSR Academy of Sciences.

[Abstract] This dissertation formulates the basic requirements for optics systems brightness amplifiers. It is demonstrated that the amplifying elements of metal-vapor pulsed lasers can be employed effectively as such amplifiers. A method is proposed and implemented experimentally for measuring the amplification characteristics of active media under working conditions in a projection optics system. An active optics projection system is implemented experimentally. The use of an amplifier in the systems studied does not degrade the resolution, which is close to the diffraction limit governed by the parameters of the objective used. Two simple schemes are proposed and implemented that can be used for microscopic working of objects by a focused laser beam while monitoring the process visually using a laser projection microscope. References 11: 10 Russian, 1 Western.
[333-6900]

THE ROLE OF POLARIZATION EFFECTS IN THE DETACHMENT OF AN ELECTRON FROM A NEGATIVE ION IN A STRONG ALTERNATING ELECTROMAGNETIC FIELD

Moscow AKADEMIYA NAUK SSSR, INSTITUT OBSHCHEY FIZIKI, LABORATORIYA VOLNOVYKH YAVLENIY, Preprint No 132 in Russian, 1984.

GOLOVINSKIY, P.A. and KIYAN, I.Yu., Institute of General Physics, USSR Academy of Sciences.

[Abstract] The role of polarization effects during multi-photon electron detachment from negative ions of alkali metal atoms is investigated for arbitrary numbers of absorbed photons. Formulas are derived for the probability of multiphoton electron detachment. It is demonstrated that polarization effects can be felt strongly during single-photon detachment, and that these effects become smaller as the number of photons required for ionization increases. Accounting for atom polarization changes the dispersion relationship for the probability of electron photodetachment: this effect reduces the maximum probability of the process. References 21: 15 Russian, 6 Western. [311-6900]

UDC 537.5

ELECTRON-BEAM FOCUSING IN HIGH-CURRENT DIODE

Moscow FIZIKA PLAZMY in Russian Vol 10, No 2, Mar-Apr 84 (manuscript received 29 Jun 83) pp 282-287

GORBULIN, Yu.M., ZLOTNIKOV, D.M., KALININ, Yu.G., SKORYUPIN, V.A. and SHASHKOV, A.Yu., Institute of Atomic Energy imeni I.V. Kurchatov

[Abstract] Electron beam focusing dynamics were investigated experimentally by means of three image converter tubes aimed with the focal point at the end of the anode and one image converter tube aimed at perpendicular to the axis of the diode. Instantaneous current densities of up to 200 KA for an instantaneous power density of $6 \cdot 10^{13}$ W·cm^{-2} were recorded. Migration of the focal point of the electron beam within its integral image was registered. The flow of the electron beam was found to be symmetrical with respect to the plane of the foil. Figures 5; references 13: 12 Russian, 1 Western. [415-6900]

PLASMA PHYSICS

PLASMA-EMISSION ENERGY CONVERSION

Moscow INSTITUT OBSHCHEY FIZIKI AN SSSR. FIZIKA PLAZMY, Preprint No 41 in Russian, 1984 (signed to press 9 Jan 84)

KIRSANOV, I.V., Institute of General Physics, USSR Academy of Sciences.

[Abstract] This study investigates a method for converting plasma thermal energy to electrical energy. A plasma heated by an external source is in contact with electrodes having different emission properties. As a result, a potential difference occurs between the electrodes, and when the circuit is closed through the load resistance current can flow. The possibility of plasma-emission conversion is demonstrated by the example of a single unidimensional system. It is found analytically that maximum efficiency is achieved by reducing the emission from the collector electrode; by the same token, increasing the emission from the emitting electrode above a certain value does not improve the efficiency of the converter. Energy applied asymmetrically from the external source increases conversion efficiency if the electrons moving to the collector electrode have more energy than the electrons moving toward the emitter. The findings agree well with experimental results, and can be used to assess the possibility of forming a virtual cathode during strong emission from the electrode and calculating the current density after such a cathode is formed. References 10: 7 Russian, 3 Western.
[327-6900]

ANALYSIS OF ION ENERGY BALANCE IN AN L-2 STELLARATOR PLASMA

Moscow INSTITUT OBSHCHEY FIZIKI AN SSSR FIZIKA PLAZMY, Preprint No 53 in Russian, 1984 (signed to press 3 Jan 84)

GREBENSHCHIKOV, S.Ye., IZVOZCHIKOV, A.B., SBITNIKOVA, I.S., SUKHODOL'SKIY, V.N. and KHUDOLEYEV, A.V., Institute of General Physics, USSR Academy of Sciences.

[Abstract] The ion energy balance equation for an L-2 stellarator plasma is solved separately from the particle balance and electron energy balance equations. A program for solving the energy balance equation for hydrogen and deuterium ions is described. The electron-ion heating, ion temperature conductance, and ion re-charging on atoms are analyzed. The subprograms employed,

the most important of which is that for calculating the penetration of neutral hydrogen atoms into the plasma filament, are explained. The calculations make it possible to determine the basic channels by which ions lose energy, and to obtain the ion temperature conductivity, the density of neutral atoms of the basic gas, and their dependence upon the radius. References 17: 11 Russian, 6 Western.
[327-6900]

A SLOW IONIZING HIGH FREQUENCY ELECTROMAGNETIC WAVE IN A THIN PLASMA CYLINDER

Moscow INSTITUT OBSHCHEY FIZIKI AN SSSR. FIZIKA PLAZMY. Preprint No 55 in Russian, 1984 (signed to press 3 Nov 83)

ALIYEV, Yu.M., BOYEV, A.G. and SHIVAROVA, A.P., Institute of General Physics, USSR Academy of Sciences.

[Abstract] This study examines propagation of a slow, high frequency, ionizing electromagnetic wave in a thin plasma cylinder with a dielectric envelope, assuming that characteristic scales of temperature conductivity and diffusion are smaller than those of the length of a plasma column. The phase characteristics of the wave, the radial and axial field distributions, and the temperature and concentration of the electrons are found. The behavior of the field amplitude along the discharge axis, is described by a nonlinear equation, and is far slower than a low-amplitude wave. In contrast to the way in which the electron density changes along the discharge axis, which is of a universal nature, the manner in which the field energy decreases depends upon the details of the ionization process, which can be used to diagnose low-temperature plasma. References 13: 7 Russian, 6 Western.
[327-6900]

CYCLOTRON ABSORPTION OF A FAST MAGNETOSONIC WAVE IN A STELLARATOR

Moscow INSTITUT OBSHCHEY FIZIKI AN SSSR. FIZIKA PLAZMY. Preprint No 120 in Russian, 1984.

KOVRIZHNYKH, L.M. and MOROZ, P. Ye., Institute of General Physics, USSR Academy of Sciences.

[Abstract] Amplification of cyclotron absorption of a fast magnetosonic wave heated at cyclotron frequency of fundamental plasma ions is investigated. It is shown that the occurrence of bounce-resonances causes interference among the contributions from different resonance angles. Expressions are derived for the absorbed power that makes it possible to judge the intensification of absorption. The intensification of absorption in a stellarator is caused by the spiral nature of the confining magnetic field. An expression is derived for the plasma currents in the stellarator magnetic field, and for the average power per unit volume of plasma absorbed on a given magnetic surface. Absorption in the

absence of bounce resonances is analyzed. The wavefields near the resonant angles are found using Maxwell's equations. A mechanism is presented which accounts for the intensified absorption of fast magnetosonic waves in the L-2 stellarator at the cyclotron frequency of the fundamental ions of the plasma. References 8: 5 Russian, 3 Western.
[327-6900]

HEATING OF IONS DURING SCATTERING OF ELECTROMAGNETIC WAVES AT FREQUENCIES CLOSE TO CYCLOTRON RESONANCE

Moscow INSTITUT OBSHCHEY FIZIKI AN SSSR FIZIKA PLAZMY. Preprint No 134 in Russian, 1984 (signed to press 28 May 84)

ISAKOV, S.B. and TSYTOVICH, V.N., Institute of General Physics, USSR Academy of Sciences.

[Abstract] This study investigates ion heating efficiency during induced scattering of two counter-propagating electromagnetic waves with frequencies close to, or on the order of, electron or ion cyclotron frequency. It is shown analytically that ion heating is least effective when the waves propagate nearly perpendicular to the external magnetic field. The possibility for ion heating during wave scattering at frequencies on the order of, but not close to, ion cyclotron frequency is demonstrated. References 2 Russian.
[327-6900]

SUPERRADIANCE IN AN UNDULATOR IN DUAL RESONANCE MODE

Moscow INSTITUT OBSHCHEY FIZIKI AN SSSR. FIZIKA PLAZMY. Preprint No 151 in Russian 1984 (signed to press 22 May 84)

BOGDANKEVICH, L.S., GELKHVIIDZE, L.K., IVANOV, V.S., KREMENTSOV, S.I., RAYZER, M.D., RUKHADZE, A.A. and FEDOTOV, A.V., Institute of General Physics, USSR Academy of Sciences.

[Abstract] The emission of a relativistic electron beam in a linearly polarized undulator magnetic field is investigated experimentally and theoretically. The Terek-I high-current accelerator was employed as the electron beam injector. A spatially periodic magnetic field was formed by a system of copper rings within the external pulse magnetic field. The resonance conditions for the longitudinal and transverse components of the magnetic field are investigated. Current transmission is found to be strongly dependent on the angle between the axis of the undulator and the axis of the solenoid. A system of equations is derived for the movement of a relativistic electron in the magnetic field of the undulator. The experimentally observed values of the resonant longitudinal magnetic field, the width of the resonant region, the transverse velocity of the electrons, and the radiation line width are explained analytically. References 10: 9 Russian, 1 Western.
[327-6900]

TWO-DIMENSIONAL PLASMA FLOWS IN A CURRENT LAYER ACCORDING TO RESULTS OF SPECTRAL MEASUREMENTS

Moscow INSTITUT OBSHCHEY FIZIKI AN SSSR FIZIKA PLAZMY. Preprint No 193 in Russian, 1984 (signed to press 31 Jul 84)

KIRIY, N.P., MARKOV, V.S., SAVCHENKO, M.M. and FRANK, A.G., Institute of General Physics, USSR Academy of Sciences.

[Abstract] The average ion energies and velocities of two-dimensional plasma currents are investigated at different current layer evolution stages by analyzing the profiles of spectral lines broadened due to the Doppler effect. The space-time characteristics of plasma glow in different atom and ion lines are investigated. Two-dimensional plasma currents are found to occur in the vicinity of the current layer, as well as within the layer, in argon. The spatial distribution of the glow in different helium spectral lines, and its time dependence, indicate that the current layer is a region of elevated electron temperature. The effective ion temperature in the layer is found, and its dynamics over time is investigated in different modes. The ion temperature comprises 20-200 eV, depending upon the type of gas and other experimental conditions. References 21: 16 Russian, 5 Western.
[327-6900]

DIAGNOSTIC METHOD FOR HF ELECTRICAL FIELDS IN PLASMA

Moscow AKADEMIYA NAUK SSSR, INSTITUT OBSHCHEY FIZIKI, FIZIKA PLAZMY, LABORATORIYA FIZIKI PLAZMY, Preprint No 173 in Russian, 1984 (signed to press 10 Jun 84)

GOL'TSMAN, V.L., ZADIRAKA, Yu.V., SILIN, V.A. and FAYZULLIN, R.Z., Institute of General Physics, USSR Academy of Sciences.

[Abstract] A method is developed for analyzing localized microwave fields in plasma that employs a weak-current diagnostic electron beam. The electron beam passes through a region of strong and small-scale plasma fields and experiences HF velocity modulation. At a certain distance from the region of interaction, the velocity modulation of the beam becomes modulation of the beam current density due to ordinary klystron grouping. The quantitative characteristics of the plasma fields can be recovered by studying the HF beam modulation with the help of a phase analyzer. The amplitude and frequency characteristics of fields in the 10-cm band are investigated analytically and experimentally. References 6: 5 Russian, 1 Western.
[308-6900]

RADIATION SUPERCOOLING OF BULK-IONIZED PLASMA OF MULTIPLY CHARGED IONS

Moscow AKADEMIYA NAUK SSSR, INSTITUT OBSHCHEY FIZIKI, LABORATORIYA VOLNOVYKH YAVLENIY, Preprint No 221 in Russian, 1984 (signed to press 10 Jul 84)

BUNKIN, F.V., DERZHIYEV, V.I., MAYOROV, S.A., YAKOVLENKO, S.I., Institute of General Physics, USSR Academy of Sciences.

[Abstract] The possibility of creating a supercooled plasma of multiply-charged ions obtained by exposing an optically thin medium to radiation from an external photon source with Planck spectrum is investigated. The plasma considered exhibits bulk losses; the ionization balance and corresponding radiation characteristics are calculated in each case for the nonequilibrium situation. The cases of stationary and expanding plasmas are analyzed. Photorecombination radiation is found to be the main cooling channel in stationary, as well as expanding, plasma. The photorecombination cooling rate is governed by the efficiency of thermal ionization of the recombined ion. Thermal ionization becomes less inefficient, and the plasma temperature increases accordingly, as the most represented ions shift from Li to He and H-like. The expansion cooling is minor in these cases, with expansion influencing the plasma temperature mainly through a shift in the charge composition which accompanies the drop in density for a given stream of ionizing particles. Significant gain (approximately 1 cm^{-1}), which can exist for several nanoseconds, is achieved at the 4-3 hydrogen-like ion transition in the forming plasma. References 16: 14 Russian, 2 Western.
[311-6900]

STRUCTURE OF A SHOCK WAVE IN PLASMA CONSIDERING RECOMBINATION AND IONIZATION. I. STATIONARY SHOCK WAVE

Moscow AKADEMIYA NAUK SSSR INSTITUT OBSHCHEY FIZIKI, LABORATORIYA VOLNOVYKH YAVLENIY, Preprint No 220 in Russian, 1984 (signed to press 12 Aug 84)

DERZHIYEV, V.I., MAYOROV, S.A. and YAKOVLENKO, S.I., Institute of General Physics, USSR Academy of Sciences.

[Abstract] Shockwave effects associated with ionization-recombination processes, specifically, the glow of the ion lines in the transitional region of the shockwave, are investigated. The qualitative theory of a shockwave in a plasma is outlined. The viscous pressure jump in gas dynamics and the transitional zone of a shockwave in plasma are analyzed. A system of equations is derived for a steady-state shockwave front for the unidimensional case. A numerical solution method and algorithm are presented. The parameters of the transitional region in the absence of non-elastic relaxation are tabulated. The behavior of the level populations of H-similar ions in the transitional region of the shockwave is analyzed using fluoride plasma as an example. References 25: 22 Russian, 3 Western.
[311-6900]

AMPLIFICATION OF LIGHT AT H-ION TRANSITIONS DURING FREE EXPANSION OF THIN PLASMOIDS OF CYLINDRICAL CONFIGURATION (TWO-PULSE PUMPING)

Moscow AKADEMIYA NAUK SSSR INSTITUT OBSHCHEY FIZIKI, LABORATORIYA VOLNOVYKH YAVLENIY, Preprint No 159 in Russian, 1984 (signed to press 25 Jun 84)

BOROVSKIY, A.V., KOROBKIN, V.V. and MUKHTAROV, Ch.K., Institute of General Physics, USSR Academy of Sciences.

[Abstract] This study examines two-pulse pumping of a plasma filament in the approximation of the adiabatic theory of plasma expansion and two heating δ -pulses. Two limiting cases are examined: one in which the second pulse is injected into the same mass of matter as the first pulse, and one in which the second pulse is injected into a fixed volume that is significantly smaller than the volume occupied by the expanding plasma at that moment. The gain is found to be determined by the sum of the energies of the first and second pulses in the first of these cases, so that two-pulse pumping has no advantages over single-pulse. However, if the second pulse heats a smaller mass than the first, two-pulse pumping can be more effective than single-pulse pumping.
References 4: 3 Russian, 1 Western.
[311-6900]

AMPLIFICATION OF LIGHT AT H-ION TRANSITIONS DURING FREE EXPANSION OF THIN CYLINDRICAL PLASMOIDS (ADIABATIC EXPANSION)

Moscow AKADEMIYA NAUK SSSR, INSTITUT OBSHCHEY FIZIKI, LABORATORIYA VOLNOVYKH YAVLENIY, Preprint No 157 in Russian, 1984 (signed to press 13 Jun 84)

BOROVSKIY, A.V., KOROBKIN, V.V. and MUKHTAROV, Ch.K., Institute of General Physics, USSR Academy of Sciences.

[Abstract] A new method is proposed for theoretical analysis of the dynamics of the gain at H-ion transitions during expansion in a vacuum of thin cylindrical plasmoids that have been heated to a state of total ionization. The approach is used to investigate the gains in an adiabatically expanding plasma, disregarding bremsstrahlung losses that cool the electron gas, and the release of recombination heat. The maximum gains that can be achieved during the expansion of these plasmoids are found. The best initial temperature or plasmoid density values are found for which the maximum gains are realized. Formulas describing adiabatic expansion are provided for reference. For adiabatic plasma expansion, the problem consists of investigating the gain as a function of three variables - time, and two parameters that are algebraic combinations of the following four quantities: the heavy particle density, the temperature, the radius, and the nucleus charge (N_0, T_0, R_0, and Z). If the quantities (t, T_0), (t, N_0), and (t, Z) are varied, and the others are held constant, the gain reaches its maximum as a function of two variables. References 16: 12 Russian, 4 Western.
[311-6900]

AMPLIFICATION OF LIGHT IN RECOMBINATION-NONEQUILIBRIUM H-ION PLASMA

Moscow AKADEMIYA NAUK SSSR, INSTITUT OBSHCHEY FIZIKI, LABORATORIYA VOLNOVYKH YAVLENIY, Preprint No 51 in Russian, 1984

BOROVSKIY, A.V., KLINKOV, V.K., KOROBKIN, V.V. and MUKHTAROV, Ch.K., Institute of General Physics, USSR Academy of Sciences.

[Abstract] An analytical formula is obtained for the light gain in a freely recombining supercooled H-ion plasma on 5-4, 4-3 and 3-2 transitions. A simple formula for the gain is derived in a shock-radiation approximation. The problem of finding the maximum gains for Te = const is solved for a fixed recombination time as well. The analytical approach employed makes possible a clearer understanding of the physical essence of the processes occurring in all stages. The plasma is shown to be far from ideal for gains in the vicinity of unity. References 15: 14 Russian, 1 Western.
[311-6900]

FORMATION OF SUPERCOOLED PLASMA BY RADIATION LOSSES IN A CONTINUOUS SPECTRUM

Moscow AKADEMIYA NAUK SSSR, INSTITUT OBSHCHEY FIZIKI, LABORATORIYA VOLNOVYKH YAVLENIY, Preprint No 63 in Russian, 1984

BUNKIN, F.V., DERZHIYEV, V.I., MAZHUKIN, V.I., PESTRYAKOVA, G.A., SAMARSKIY, A.A., CHETVERTUSHKIN, V.N. and YAKOVLENKO, S.I., Institute of General Physics, USSR Academy of Sciences.

[Abstract] This study investigates the possibility of obtaining a supercooled (strongly recombining) plasma due to radiation losses in the continuous spectrum. Estimates are made of the cooling time, and a criterion for supercooling in the quasi-steady-state condition is derived. The radiation gas dynamic problem for the expansion of a plane layer subjected to external thermal radiation is investigated numerically. Plasma supercooling is found to be significant in the expansion of a beam subjected to an external photon stream with Planck spectrum if the intensity of that stream is far below the equilibrium value for a given Planck distribution. References 33: 31 Russian, 2 Western.
[311-6900]

BRANCHES OF THERMAL PHYSICS AND APPLICATIONS DISCUSSED

Moscow NTR: PROBLMY I RESHENIYA, 2-15 Jul 85 p 6

KUTATELADZE, S., academician, director of the Institute of Thermal Physics of the Siberian Branch of the USSR Academy of Sciences

[Abstract] The author discusses in a general way the objects of study of thermal physics, which he says became established as a scientific direction in the 1950s and 1960s, investigating phenomena which involve complex interactions of thermodynamic processes in all aggregate states of matter. He comments briefly on the following branches of thermal physics and characterizes their applications: transport theory, and theory of transport and caloric properties of substances; heat engineering; mechanics of gas-liquid systems; nonequilibrium thermal gas dynamics; cryohydrodynamics; dynamics of thermal plasma.

An editorial preface to the article mentions some contributions of the Institute of Thermal Physics to science and technology. For example, the institute is credited with having carried out the first systematic research of wave dynamics of gas-liquid systems using electrochemical, optical-fiber and Doppler (with lasers) diagnostic methods. It is said to have been the first to discover experimentally the existence of shock rarefaction waves in homogeneous media with absence of phase transitions and external energy exchange. The institute's department of laser physics is said to be developing successfully; one of its achievements has been the heightening of the resolving power of optical spectroscopy by more than a million times, through exclusion of the influence of the Doppler effect.

FTD/SNAP
/9716
CSO: 1862/60

UDC 621.383.78

MICROCHANNEL ANALYZER FOR RECORDING PARTICLE AND X-RAY EMISSION FROM LASER PLASMA

Moscow KRATKIYE SOOBSHCHENIYA PO FIZIKE in Russian No 5, May 85 (manuscript received 24 Jan 85) pp 16-20

BARABASH, L.Z., BRAGIN, B.N., GOLUBEV, A.A., GROMOV, A.I., ZAKHARENKOV, Yu.A., MALYSHEVA, V.S., NIKITENKO, A.I., NIKITINA, A.F., RYAZANOV, G.V., KHAYDAROV, R.T., SHARKOV, B.Yu., SHAMAYEV, O.B. and SHIKANOV, A.S., Institute of Physics imeni P.N. Lebedev, USSR Academy of Sciences

[Abstract] A microchannel analyzer has been developed for recording the emission of particles and x-rays from a laser plasma. It consists of several camerae obscurae facing the target, some open for recording ions and some covered by beryllium or aluminum filters for recording soft and hard x-radiation, a microchannel plate behind the cameras which converts x-radiation or ion flux into an electron flux, and a fiber-optic plate behind the microchannel plate with an aluminized luminescent coating for conversion of the electron flux into visible radiation. The electron flux is first amplified in the microchannel plate, the latter having an outer diameter of 40 mm and containing an array of channels whose diameter of 13 μm determines the spatial resolution of the analyzer. The gain of 10^2-10^4 depends on the voltage across the microchannel plate, and a plane-parallel electric field behind that plate transfers the amplified electron flux onto the luminescent screen coated on the fiber-optic plate. The visible radiation coming out of the latter is recorded on Foto-250 high-sensitivity film pressing against that plate on the back side. The analyzer has been calibrated against an MIR-3 x-ray microscope operating in the continuous mode for sensitivity to hard x-radiation ($\hbar\nu > 3$ keV) and against a plasma pulse source generated by a CO_2-laser in a solid lead target for sensitivity to soft x-radiation ($\hbar\nu$ = 1-3 keV) or 1-10 keV ions. The calibration includes flux amplification versus plate voltage, relative flux yield versus filter thickness, absolute flux yield versus amplitude of input signal, with filter material (Be, Al) and filter thickness, distance from target to camera obscura and distance from camera obscura to microchannel plate, voltage across microchannel plate, and voltage between microchannel plate and fiber-optic plate (luminescent screen) being adjustable parameters of the instrument. Figures 3; references 4: 3 Russian, 1 Western. [54-2415]

UDC 533.9.07

MAGNETIC ANALYZER OF HIGH-ENERGY IONS FROM THERMONUCLEAR TARGETS COMPRESSED BY LASER BEAM

Moscow KRATKIYE SOOBSHCHENIYA PO FIZIKE in Russian No 5, May 85 (manuscript received 24 Jan 85) pp 21-24

YEROKHIN, A.A., ZAKHARENKOV, Yu.A., SKLIZKOV, G.V. and SHIKANOV, A.S., Institute of Physics imeni P.N. Lebedev, USSR Academy of Sciences
WORYNA, E., DENUS, S., MAMCZUR, M., MROZ, W., NAGRABA, S. and FARNA, J., Institute of Plasma Physics and Laser Microsynthesis imenia Kaliski, Warsaw/POLAND

[Abstract] A magnetic mass-spectrograph has been built for spectral analysis of protons produced by the D-D reaction and of high-energy hydrogen ions accelerating through the rarefied corona of the laser plasma on a compressed target. Its design is based on the principle of ideal focusing, which can be maintained even also with wide entrance slits. The distance from target to analyzer is 1.5 m, and the solid angle covered is of the order of 10^{-5} sr or approximately 10 times larger than that covered by earlier built mass-spectrographs. The design and the performance of this instrument are in accordance with proton and ion ballistics and energy distributions during compression, ablation, and evaporation. The analyzer geometry and ion-optical characteristics conform to structural features of and operating conditions in the "Delfin" experimental laser facility. The magnetic field is produced by an electromagnet with cylindrical core 225 mm in diameter and two face plates. Heterogeneity of the magnetic field below 100 mT intensity limits the resolving power of the instrument. The recording device is an LR 115 CR-39 track detector made of cellulose nitrate and placed on the focus line, with the tracks being counted and analyzed by an AMD-1 automatic scanning microdensitometer. Microchannel plates operating in the current-amplifier mode can also be used as high-sensitivity track detectors. Figures 2; references 8: 4 Russian, 4 Western.
[54-2415]

A MECHANISM FOR PLASMA MIRROR FORMATION IN A CAVITY

Moscow ZHURNAL EKSPERIMENTAL'NOY I TEORETICHESKOY FIZIKI in Russian Vol 88, No 2, Feb 85 (manuscript received 26 Apr 84) pp 436-444

FISHER, V.I., Astronomical Observatory, Odessa State University imeni I.I. Mechnikov.

[Abstract] The processes occurring in a cavity containing a plasma mirror are investigated theoretically. Plasma scattering in a field of intense multimode radiation, reflection, and amplification of the radiation are examined. The structure of the train of laser pulses is analyzed. The dynamics of the coefficient of reflection is found to be associated with the radiation dynamics only through the plasma hydrodynamics. The self-consistent model that is developed explains all of the regularities observed in experiments in the plasma of the cavity. References 27: 24 Russian, 3 Western. [246-6900]

HYDRODYNAMICS OF PLASMA COMPRESSION WITH A MAGNETIC FIELD BY A THIN CYLINDRICAL WALL

Moscow ZHURNAL EKSPERIMENTAL'NOY I TEORETICHESKOY FIZIKI in Russian Vol 88, No 2, Feb 85 (manuscript received 12 May 84) pp 445-459

VELIKOVICH, A.L., GOLBERG, S.M., LIBERMAN, M.A. and FELBER, F.S., Institute of Physical Problems, USSR Academy of Sciences.

[Abstract] The hydrodynamics of plasma compression with a magnetic field are examined using the classical transfer coefficients for the plasma. Although the diamagnetic currents that occur in the plasma effectively reduce the magnetic Reynolds number, it is nonetheless shown that they do not hinder magnetic field compression. Self-similar solutions of the single-fluid hydrodynamic equations of a plasma are examined that describe cylindrically-symmetrical compression of a plasma with a magnetic field. The self-similar solutions obtained make it possible to assess the role of various processes in the formation of the boundary layer near the wall, and to calculate the magnetic flux losses as the plasma is compressed. The results of numerical integration of the complete system of unidimensional hydrodynamic equations describing compression of the plasma by the envelope are presented. The analytical results agree well with the self-similar solutions. The calculations show, inter alia, that shell compression of a plasma with a magnetic field is highly effective, and that the results depend little upon the state equation of the shell, its conductivity, its temperature conductance, its heat capacity, and its compressibility. References 12: 7 Russian, 5 Western. [246-6900]

UDC: 533.951.8

FORCES ACTING UPON A PLASMA FILAMENT IN TRANSVERSE MULTIPOLE MAGNETIC FIELDS

Moscow FIZIKA PLAZMY in Russian Vol 11, No 1, Jan 85 (manuscript received 28 May 84) pp 51-52

LEVIN, M.L. and RABINOVICH, M.S., Institute of General Physics, USSR Academy of Sciences.

[Abstract] A non-MHD approach to the investigation of plasma discharge stability is developed in which a Lagrange function is constructed for thin curvilinear filaments and long-wave 'serpentine' perturbations, after which the investigation of stability becomes a standard problem of analytical dynamics. The proposed approach assumes that $a<\Delta<\lambda$, in contrast to the ordinary MHD method, which assumes that the opposite strong inequality $\Delta<a,\lambda$ is satisfied, where a is the filament radius, Δ is the transverse displacement and λ is the longitudinal scale of the perturbation. It is shown that the Lagrangian approach is equivalent to the MHD method only for qaudruple external fields. References 2 Russian.
[253-6900]

UDC: 533.9.07

INVESTIGATION OF CURRENT GENERATION BY LOWER HYBRID WAVES IN A T-7 TOKAMAK

Moscow FIZIKA PLAZMY in Russian Vol 11, No 1, Jan 85 (manuscript received 30 May 84) pp 53-61

ALIKAYEV, V.V., GROZDKOV, Yu.V., DYATLOV, Y., ZHACHEK, F., IVANOV, D.P., IVANOV, N.V., IL'IN, V.I., KAKURIN, A.M., KISLOV, A.Ya., KLIMA, R., KOVROV, P.Ye., KOPETSKIY, V., KOCHIN, V.A., NEUDACHIN, S.V., PREINGAYEL'TER, Y., KHVOSTENKO, P.P., KHROMKOV, I.N., CHISTYAKOV, V.V., SHTEKL, Ya. and YAKUBKA, K., Institute of Atomic Energy imeni I.V. Kurchatov, Institute of Control Problems, Institute of Plasma Physics, Czechoslovakian SSR.

[Abstract] This study presents experimental results of the generation of current in the T-7 tokamak. Analysis indicates that the main cause of the loss of directional movement energy by electrons during the generation of current by lower hybrid waves is coulomb collision. In order to generate current which significantly exceeds the level predicted by quasi-linear theory, more complex nonlinear processes of interactions between lower hybrid waves and plasma must occur. The current density profile changes significantly when high frequency power is injected into a plasma. This probably also caused the increase observed in the diffusion lifetime of the plasma. References 17: 6 Russian, 11 Western.
[253-6900]

UDC: 533.951.8

FORMATION OF A CURRENT PROFILE AT THE T-10 TOKAMAK INSTALLATION

Moscow FIZIKA PLAZMY in Russian Vol 11, No 1, Jan 85 (manuscript received 27 Feb 84) pp 62-67

NOTKIN, G.Ye., Institute of Atomic Energy imeni I.V. Kurchatov.

[Abstract] A method is presented for obtaining stable reproducable discharges with random $q_L < 4$ for use at a T-10 tokamak. In the proposed method, optimal current density distribution is obtained using the cross-section of the plasma filament; then the radial distributions of the electron temperature and the effective charge of the plasma are changed by controlling the stream of working gas and admixtures on the surface of the plasma filament. The factors underlying macroscopic interruptions of the plasma current and ways of preventing such interruptions are described. The method makes it possible to obtain stable reproducable discharges with $q_L \gtrsim 2$ over a wide range of concentration of admixtures. References 12: 9 Russian, 3 Western.
[253-6900]

UDC: 533.932

BEHAVIORAL CHARACTERISTICS OF THE FUNCTION OF ION DISTRIBUTION IN A TOKAMAK PLASMA DURING MAGNETIC ADIABATIC COMPRESSION

Moscow FIZIKA PLAZMY in Russian Vol 11, No 1, Jan 85 (manuscript received 27 Feb 84) pp 91-95

KISLYAKOV, A.I., KRASIL'NIKOV, A.V. and SHCHEMELININ, S.G., Physical-Technical Institute imeni A.F Ioffe, USSR Academy of Sciences.

[Abstract] The plasma particle distribution function during adiabatic compression by a magnetic field is modeled by solving the kinetic equation numerically. It is shown that the ion distribution function can become significantly non-Maxwellian and anisotropic during compression. Delay in establishing Maxwellian equilibrium increases the energy contribution to the ion component, and must be taken into account in determining ion heating efficiency from the spectra of the charge exchange atoms. Analogous effects in the electron component of the plasma are manifested significantly less strongly. References 5: 4 Russian, 1 Western.
[253-6900]

UDC: 533.9.01

CHARGED PARTICLE BEAM SELF-FOCUSING IN INHOMOGENEOUS PLASMA

Moscow FIZIKA PLAZMY in Russian Vol 11, No 1, Jan 85 (manuscript received 3 May 84) pp 96-103

GOREV, V.V. and ZAKHAROV, S.V., Institute of Atomic Energy imeni I.V. Kurchatov.

[Abstract] This study investigates self-focusing of charged particle beams by two physical phenomena occurring in a plasma: 1) increased compensation of beam charge in a plasma with increasing density; 2) generation of a magnetic field by thermal convection currents in inhomogeneous plasma. The movement of beam particles in an inhomogeneous electromagnetic field is analyzed; an equation is derived for the envelopes of trajectories of the beam particles. Self-focusing of a relativistic beam of electrons in a rarified plasma and of a charged particle beam in the magnetic field produced by thermal convection currents is examined. The degree of compression of a relativistic electron beam is estimated as an example. References 12: 9 Russian, 3 Western. [253-6900]

UDC: 533.9+621.039.627

LASER-DRIVEN X-RAY EMISSION FROM A PLASMA FOCUS

Moscow FIZIKA PLAZMY in Russian Vol 11, No 1, Jan 85 (manuscript received 23 Feb 84) pp 117-122

GRIBKOV, V.A., DENUS, S., DUBROVSKIY, A.V., ISAKOV, A.I., KALACHEV, N.V., KROKHIN, O.N., NIKULIN, V.Ya., SLEDZIN'SKIY, S. and CHEKAY, S., Institute of Physics imeni P.N. Lebedev, USSR Academy of Sciences, Institute of Plasma Physics and Laser Microsynthesis imeni S. Kiliskiy, Polish People's Republic.

[Abstract] Reliable methods are found for providing space-time synchronization between powerful laser radiation and the plasma focus. The influence of powerful radiation of plasma dynamics and the associated plasma focus emissions is studied. The experiments were conducted on a setup employing a 'Phillips' type plasma focus, a pulsed neodymium glass laser and a system to synchronize the laser and the plasma focus. A dense elongated pinch strictly tied to the focusing point of the laser occurs above the anode when laser radiation strikes the anode prior to the occurrence of a soft X-ray pulse. The effect of powerful laser radiation prior to the initiation of a hard X-ray pulse changes the spectrum of the pulse and reduces the intensity of the hard component while increasing the intensity of the soft component of the radiation. This means that locked laser-beam heating of the plasma in the X-ray mode requires two laser pulses with energy ranging from 10 to 50 J; the first pulse forms a dense pinch, and the second produces a combined beam-laser effect that increases the neutron yield. References 10: 6 Russian, 4 Western. [253-6900]

PROGRESS IN CONTROLLED FUSION RESEARCH DESCRIBED

Moscow MOSKOVSKAYA PRAVDA, 24 Nov 85 p 2

SORIN, L., Professor, MOSKOVSKAYA PRAVDA science commentator (interviewer)

[Excerpt] Everything possible must be done to study the possibilities of utilizing sources of energy which will be practically inexhaustible. This dictates the tactics and strategy of the acceleration of technological progress in power engineering.

Our science commentator talked with one of the leaders of the controlled thermonuclear fusion program, academician B. B. Kadomtsev, Lenin Prize laureate, about the accomplishments and plans of Soviet physicists.

"Boris Borisovich, it would be interesting to learn about the results and goals of the Moscow physicists who are working on problems of thermonuclear power engineering."

"Two approaches to the solution of the problem of fusion can be seen. One of them involves the use of strong magnetic fields and superconductivity. This approach is being pursued with tokamak devices by scientists of the Department of Plasma Physics and Stationary Controlled Fusion Systems of the Institute of Atomic Energy imeni Kurchatov. The second approach is the method of microexplosions, which is being developed at the USSR Academy of Sciences' Physics Institute imeni Lebedev under the direction of academician N.G. Basov (laser fusion).

"The tokamak concept, which has now spread to laboratories throughout the world and, it is generally agreed, is the most fully studied aspect of the complex of problems of controlled fusion, was formulated and advanced at the Institute of Atomic Energy under the direction of academician L.A. Artsimovich as early as the 1960s."

"What is the present state of affairs?"

"At present, tokamak devices have reached a level making it possible to demonstrate very reliably the existence of a high-temperature plasma with the parameters required for fusion. A tokamak is a highly complex piece of equipment consisting of a toroidal chamber placed in a magnetic field. In this chamber, a smooth and controlled fusion reaction is supposed to go on for a long time.

"It will still take a considerable amount of time before it becomes feasible to create and maintain a plasma in the conditions necessary for stable fusion. The next step is the stage of engineering work (which has already begun) and of the development of a fusion reactor. This will take at least another 10-12 years. Controlled fusion is thus a technology aimed at the 21st century. It appears that fusion will make its contribution to the world's power supply somewhere in the first quarter of the 21st century. These are the results and the realistic prospects."

"Boris Borisovich, you represented Soviet science at the recent International Conference on the Physics of Controlled-Fusion Plasma in Budapest, where work on this problem on a worldwide scale was summed up, and the results obtained by scientists of various countries, including Soviet physicists, were evaluated."

"It is universally recognized that the main trend in the solution of the problem of the technological implementation of controlled fusion lies in the development of large-scale tokamaks. In our country, the large Tokamak-15 unit is now being developed. It uses superconducting coils, which are an original development. The Tokamak-15 is expected to begin generating a high-temperature plasma in two or three years. In the United States, Europe and Japan, three units have been developed, in which experiments for generating plasma with a temperature of 60-100 million degrees are under way."

"In one of your joint publications with academician Ye.P. Velikhov, a Soviet project for developing a so-called fission--fusion reactor was discussed. It would bridge the gap between conventional uranium and pure fusion power engineering. At what stage of development is this project?"

"Of great practical interest is this project, which is now under way and which aims at developing an experimental fusion reactor in which, in addition to the generation of fusion power, a plutonium (a fuel for conventional nuclear reactors) can be produced from so-called waste uranium (conventional nuclear power wastes). The development of such reactors could become the first stage in the engineering and industrial mastery of controlled fusion.

"Such units could operate in conjunction with several conventional nuclear power stations, permitting a transition to low-waste nuclear power engineering."

FTD/SNAP
/9716
CSO: 1862/68

UDC 537.312.62

MOVING SOLITONS IN SUPERCONDUCTORS AND PEYERLS SYSTEMS

Moscow KRATKIYE SOOBSHCHENIYA PO FIZIKE in Russian No 5, May 85 (manuscript received 14 Mar 85) pp 56-59

PANYUKOV, S.V., Institute of Physics imeni P.N. Lebedev, USSR Academy of Sciences

[Abstract] An exact solution to the problem of moving solitons in anisotropic superconductors and in Peyerls systems is obtained by the method of reduction to the reverse problem of scattering, which has already yielded exact "quiescent soliton" solutions. Metals with almost plane segments of the Fermi surface are considered, and that surface is assumed to have the form of a parallelepiped. The equilibrium value of the order parameter is determined from the effective soliton action in terms of scattering parameters of the electronic subsystem and electron-phonon interaction parameters, with the aid of quasi-classical Green functions integrated with respect to the energy variable. The order parameter for a single domain wall and a charged polaron is then calculated, assuming first a quiescent soliton, whereupon the surface energy of a domain well is found by a Legendre transformation of the soliton action. Complete integrability with respect to time makes it possible to obtain an exact "moving soliton" solution, in the absence of pinning by structural defects. References: 4 Russian.
[54-2415]

TEMPERATURE DIAGNOSIS OF A MIXTURE OF MOLECULAR GASES HEATED BY CW CO_2 LASER

Moscow AKADEMIYA NAUK SSSR, INSTITUT OBSHCHEY FIZIKI, LABORATORIYA VOLNOVYKH YAVLENIY, Preprint No 223, in Russian, 1984

ALEKSANDRESKU, R., BUNKIN, F.V., LUKLYAMCHUK, B.S., MIKHAYLESKU, Y., MOROZOVA, Ye.A. and SHAFEYEV, G.A., Institute of General Physics, USSR Academy of Sciences.

[Abstract] A method is proposed for measuring the temperature of a gas mixture, heated by CW radiation from a CO_2 laser, in the zone of radiation operation based on information contained in the radiation spectra of the gas mixture. The radiation spectra of heated mixtures of SF_6 and molecular gases--ammonia, xenon, helium, and air--are observed experimentally. It is demonstrated that the temperature of the gas mixture in the laser interaction region can be recovered from these thermal radiation spectra. It is also possible to determine the temperature conductivity and the heat conduction, as well as the partial pressure of each of the components of the mixture. The thermal spectra contain information on the dynamics of the nonequilibrium thermochemical processes occurring in the gaseous phase and make it possible, inter alia, to identify intermediate reaction products. References 26: 14 Russian, 12 Western. [311-6900]

UDC: 536.12:539.377

INFLUENCE OF CONVECTIVE HEAT TRANSFER ON THERMAL STRESS STATE OF TRANSVERSELY ISOTROPIC SPHERE

Kiev MATEMATICHESKIYE METODY I FIZIKO-MEKHANICHESKIYE POLYA in Russian, No 21, 1985 (manuscript received 14 Feb 83) pp 44-48

GROMOVYK, V.I., STASYUK, S.T. and BOZHENKO, M.V., Institute of Applied Mechanics and Mathematics Problems, Ukrainian Academy of Sciences, Lvov.

[Abstract] The purpose of this work is to explain the influence of conductive heat transfer and the power of internal heat sources on the temperature stresses arising in a hollow sphere made of a transversely isotropic material. Graphs are presented of the changes in temperature stresses arising in the hollow

sphere. The variation of radial and meridional stresses as a function of dimensionless radius are investigated for various values of Bi. References 7: 6 Russian, 1 Western.
[028-6508]

UDC: 539.377

TEMPERATURE STRESSES IN A THIN PLATE HEATED BY A PERIODIC SYSTEM OF HEAT SOURCES

Kiev MATEMATICHESKIYE METODY I FIZIKO-MEKHANICHESKIYE POLYA in Russian, No 21, 1985 (manuscript received 7 Dec 82) pp 49-54

POPOVICH, V.S. and NATALYUK, I.I., Institute of Applied Mechanics and Mathematics Problems, Ukrainian Academy of Sciences, Lvov.

[Abstract] A study is made of a thin isotropic plate with physical characteristics which are independent of temperature. It is assumed that the plate is loaded over a finite interval of time by evenly spaced heat sources which are located on a single straight line. Convective heat exchange with a medium at zero temperature occurs through the lateral surfaces of the plate. The initial temperature of the plate is also equal to zero. Graphs are plotted illustrating the distribution of stresses along the coordinate axis. References 3 Russian.
[028-6508]

UDC: 539.377

THERMOELASTICITY PROBLEM FOR STRIP PLATES HEATED BY A MOVING HEAT SOURCE

Kiev MATEMATICHESKIYE METODY I FIZIKO-MEKHANICHESKIYE POLYA in Russian, No 21, 1985 (manuscript received 31 Jan 83) pp 54-57

KULIK, A.N., Institute of Applied Mechanics and Mathematics Problems, Ukrainian Academy of Sciences, Lvov.

[Abstract] A previous work determined the steady-state temperature field of a thin strip-plate heated by a constant power heat source moving at a constant speed along the mid line of the plate, using the method of integral transforms. The present work also uses this same method to determine the temperature stresses caused by a heat source moving according to a predetermined law, the power of which is a known function of time. References 3 Russian.
[028-6508]

SYNCHROTRON RADIATION OF AN ELECTRON IN COHERENT STATE

Moscow TEORETICHESKAYA I MATEMATICHESKAYA FIZIKA in Russian Vol 61, No 2, Nov 84 (manuscript received 27 Oct 83) pp 293-300

BOBROV, A.A., DOROFEYEV, O.F. and CHIZHOV, G.A., Moscow State University.

[Abstract] Basis functions which remain steady within a frame of reference are analyzed in order to describe the electromagnetic radiation of a particle moving in a magnetic field in terms of quantum mechanics. The 'classical' and 'quantum' parts of the radiation are separated on the basis of coherent states. The use of coherent states makes it easy to isolate the terms of corresponding to classical description; and these terms contain complete information about the quantum mechanical behavior of the system. References 16: 13 Russian, 3 Western.
[6900-152]

DETERMINATION OF STOCHASTIZATION BOUNDARY OF PERTURBATION MOVEMENT BY IR LASER EXCITATION AND ELECTRON COLLISION

Moscow PIS'MA V ZHURNAL EKSPERIMENTAL'NOY I TEORETICHESKOY FIZIKI in Russian Vol 40, No 10, 25 Nov 84 (manuscript received 10 Oct 84) pp 432-434

AKULIN, V.M.; VURDOV, V.D.; YESADZE, G.G.; KARLOV, N.V.; PROKHOROV, A.M.; SUSANIN, A.A. and KHOKHLOV, E.M., Institute of General Physics, USSR Academy of Sciences

[Abstract] The boundary of stochastization of vibrational molecule motion is determined, and its spectral behavior identified. The experiment was performed using CF_3I and SF_6 molecules with different symetries. The amount of reserved energy are determined optoacoustically. The spectral behavior of the boundary of the region within which the SF_6 molecule is stochastic agrees qualitatively with the theory in terms of position, characteristic form and minimum value. References 3: 2 Russian, 1 Western.
[6900-155]

UDC: 539.3:534.1

PROPAGATION OF ACOUSTICOELECTRIC WAVE IN PIEZOCERAMIC HOLLOW CYLINDER AND LAYER

Kiev MATEMATICHESKIYE METODY I FIZIKO-MEKHANICHESKIYE POLYA in Russian, No 21, 1985 (manuscript received 23 May 83) pp 76-79

LOZA, I.A. and SHULGA, N.A., Institute of Mechanics, Ukrainian Academy of Sciences, Kiev.

[Abstract] A study is made of axisymmetrical acousticoelectric waves in a hollow piezoceramic cylinder polarized through its thickness and, as a particular case, a flat layer. The amplitudes of the traveling waves are represented by exponential series with respect to the thickness coordinate, the coefficients of which are determined from recurrent relationships. The third branch of the dispersion equations for the hollow cylinder virtually coincide with the corresponding branch for a flat layer. References 11: 9 Russian, 2 Western.
[028-6508]

UDC: 539.3

OPTIMIZATION OF DYNAMIC EFFECTS UPON ROTATION OF AXISYMMETRICAL BODY AROUND ITS AXIS

Kiev MATEMATICHESKIYE METODY I FIZIKO-MEKHANICHESKIYE POLYA in Russian, No 21, 1985 (manuscript received 6 Jan 83) pp 97-100

GERA, B.V., Institute of Applied Mechanics and Mathematical Problems, Ukrainian Academy of Sciences, Lvov.

[Abstract] A study is made of a thin elastic cylindrical shell of finite length with a constant radius and thickness. The problem is to determine the energetically optimal loading condition which provides, in a fixed time, rotation of the elastic shell plus solid body system about its longitudinal axis at a fixed angle. References 1 Russian.
[028-6508]

UDC: 539.377

OPTIMIZATION OF FORCE LOAD IN CYLINDRICAL SHELL WITH FINITE SHEAR RIGIDITY

Kiev MATEMATICHESKIYE METODY I FIZIKO-MEKHANICHESKIYE POLYA in Russian, No 21, 1985 (manuscript received 31 Mar 83) pp 100-103

BUGRIY, N.I., Lvov University.

[Abstract] A study is made of a circular cylindrical shell of known length and constant thickness. The problem is to determine a steady-state distribution of force load such that the optimally low level of stress is achieved. The optimization criterion is the functional of energy of elastic deformation of the shell. The optimal load obtained under the same conditions within the classical Kirkhoff-Love theory has somewhat larger gradient than that obtained in the present article. The maximum values of circumferential stresses obtained by the two methods differ by less than 1%. References 4 Russian.
[028-6508]

UDC 534.222

NONLINEAR PROPAGATION OF SPATIALLY BOUNDED TRANSVERSE WAVES THROUGH ISOTROPIC SOLID MEDIUM

Moscow KRATKIYE SOOBSHCHENIYA PO FIZIKE in Russian No 6, Jun 85 (manuscript received 22 Mar 85, after revision 5 May 85) pp 43-47

ZABOLOTSKAYA, Ye.A., Institute of Physics imeni P.N. Lebedev, USSR Academy of Sciences

[Abstract] Nonlinear propagation of spatially bounded transverse waves through an isotropic solid medium is analyzed, assuming only synchronous interaction of transverse and longitudinal waves with attendant cumulative effects. From the fundamental stress-tensor displacement vector equation describing the propagation of elastic waves through an isotropic medium with dissipation and viscosity is, accordingly, derived an equation describing the nonlinear propagation of quasi-plane transverse waves through such a medium. This equation is a third-order approximation, since no distortion of plane transverse waves appears in the second-order approximation. After explication into a system of equations in the displacement components in a system of "slow" coordinates, and subsequent elimination of the longitudinal displacement component, it is reduced to a system of equations of third-order smallness with respect to displacement perturbations. The quadratic mode in these equations vanishes for waves with linear, circular, or elliptic polarization so that a quadratic nonlinearity does not generate a second harmonic directly. It can generate a second harmonic only indirectly, namely by mixing the fundamental component with a third harmonic generated by a cubic nonlinearity. This is demonstrated on a shear wave with Gaussian amplitude distribution and linear polarization. Accordingly, a second harmonic is not

possible in the plane-wave approximation but becomes possible when diffraction is taken into account. References: 9 Russian.
[53-2415]

GENERALIZED MODEL OF RANDOM MATRICES: STATISTICAL AND CORRELATION PROPERTIES OF OPERATORS IN VARIABLE BASIS

Moscow YADERNAYA FIZIKA in Russian Vol 41, No 1, Jan 85 (manuscript received 22 Dec 83) pp 42-52

ISAYEV, P.N., Institute of Nuclear Physics, Siberian Department, USSR Academy of Sciences.

[Abstract] Statistical and correlational properties of internal state overlapping integrals of and distortion matrices in a variable basis are examined. Distortion and mixing of simple (shell) states in a random matrix model are investigated. It is found that the scale of the correlations and overlap integrals is determined by the scale of the distortion of simple (shell) states. The statistical model for random matrices is extended to include a variable basis, making it possible to investigate the shape of the correlation attenuation. The characteristic value of the attenuation scale σ_E is 15 - 20% of the single-frequency scale σ_F, and for energies exceeding 30 MeV it depends little upon the excitation energy. References 15: 7 Russian, 8 Western.
[248-6900]

NONLINEAR STAGE OF RAYLEIGH-TAYLOR INSTABILITY

Moscow AKADEMIYA NAUK SSSR Preprint No 27 in Russian, 1984.

GAMALIY, Ye.G., LOBODA, P.A., ROZANOV, V.B., SERGOYAN, G.M. and SHYMSKIY, S.A., Physics Institute imeni P.N. Lebedev, USSR Academy of Sciences.

[Abstract] The Rayleigh-Taylor instability of the interface between two incompressible nonviscous liquids in a gravitational field is investigated. The Lagrange formalism is shown to be applicable, and equations are derived within its framework that describe the behavior of the interface between two liquids for the initial stage of Rayleigh-Taylor instability. The same equations are also derived by a different method based on expanding the velocity potential by the fundamental solutions of the linear problem. The nonlinear equations obtained for three harmonics are investigated numerically and analytically by sequential approximation. The exponential growth of the initial perturbations is found to saturate, due both to interaction between harmonics and self-saturation of individual harmonics. The increase in the perturbation amplitudes is investigated as a function of the initial values, as well as the Atwood number A. The increase in the amplitude of the perturbations is shown to be a decreasing function of A, while this increase is independent of A in linear theory. References 12: 3 Russian, 9 Western.
[335-6900]

PERTURBATION OF INTERFACE SURFACE DURING PHASE TRANSITIONS RESULTING FROM STRONG MONOCHROMATIC RADIATION

Moscow AKADEMIYA NAUK SSSR Preprint No 34 in Russian, 1984.

SAMOKHIN, A.A., Physics Institute imeni P.N. Lebedev, USSR Academy of Sciences.

[Abstract] Dispersion equations are derived for thermal and hydrodynamic perturbations on the phase interface surfaces during the melting of a solid body and the evaporation of liquid caused by strong monochromatic radiation. The purpose of the study is to explain the mechanisms underlying the formation of small-scale periodic structures on an irradiated surface. It is shown analytically that the formation of periodic structures on an irradiated surface corresponds to a new type of Raman scattering. A major role is played by electrodynamic thermal and hydrodynamic perturbations on the interface surface in the condensed medium, in contrast to, e.g., Mandelstan-Brillouin, combination, or entropy scattering. References 20: 16 Russian, 4 Western.
[335-6900]

TWO TYPES OF NONLINEAR OPTICAL SUSCEPTIBILITY

Moscow AKADEMIYA NAUK SSSR Preprint No 42 in Russian, 1984.

VINOGRADOV, An.V., Physics Institute imeni P.N. Lebedev, USSR Academy of Sciences.

[Abstract] The existence of two different types of terms in the expansion by powers of the polarization field is investigated. The concept of dynamic and kinetic nonlinear optical susceptibilities is introduced. The nonlinear optical susceptibities are obtained by expanding the density matrix of a system consisting of a substance and an electromagnetic field into a perturbation-theory series with respect to the interaction between them. Dynamic susceptibilities are associated with the regular terms of such a series for the dynamic time-reversible equation for the density matrix. Kinetic deceptibility, on the other hand, is associated with the diverging, secular terms of that series. An exposition of perturbation theory is given in a form that makes it possible to calculate both types of nonlinear optical susceptibilities. An example is given of the derivation of the balanced kinetic equation, which can be extended to the case in which perturbation theory includes divergences caused by the occurrence of resonance, in addition to secular divergences. The occurrence of resonance makes it possible to isolate a certain class of patterns, and thus to close the system of renormalization equations.
References 11: 8 Russian, 3 Western.
[335-6900]

UDC 519.9

DIFFERENTIAL GAMES OF PURSUIT WITH INTEGRAL CONSTRAINTS

Dushanbe DOKLADY AKADEMII NAUK TADZHIKSKOY SSR in Russian Vol 28, No 5, May 85 (manuscript received 16 Nov 84) pp 258-261

MUKHSINOV, Ye.M., Leninabad State Pedagical Institute imeni S.M. Kirov

[Abstract] A linear differential game of pursuit is considered with integral constraints on the player's controls. The game is described by the general equation $\dot{x} = Ax - Bu - Cv$ ($\dot{x}$ - strong derivative of $x \in X$ with respect to time $t \geq 0$, $u \in Y$ - pursuer's controls, $v \in Z$ - evader's controls, X,Y,Z - separable Hilbert spaces, $A:X \to X$, $B:Y \to X$, $C:Z \to X$ - linear constrained operators) and the terminal set M - a closed linear subspace of the X-space. The sufficient conditions for successful evasion are established on the basis of two theorems pertaining to the evader's controls at certain distances from point x(t) to subspaces M and $M^{\perp}$. The possibility of evasion in two games, $\frac{d}{dt}z(T,s) = \int_a^b K(s,\tau)z(t,\tau)d\tau - u(t,s) + v(t,s)$ and $-Bu + Cv = -u + v$ with $X - 1_2^b = \{x = (x_1,x_2,\ldots): \sum_{i=1}^{\infty} x_i^2 < \infty\}$, is demonstrated for illustration. Article was presented by Academician (TaSSR Academy of Sciences) A.D. Dzhurayev on 14 November 1984. References: 4 Russian.
[52-1425]

UDC: 62-50

POSITIONAL ℓ-CAPTURE IN A GAME OF ONE PURSUED AND SEVERAL PURSUERS

Moscow PRIKLADNAYA MATEMATIKA I MEKHANIKA in Russian Vol 48, No 4, Jul-Aug 84 (manuscript received 13 Jul 83) pp 574-579

KHAYDAROV, B.K.

[Abstract] A differential game with several pursuers moving at different rates toward a single pursued is examined. A special pursuer strategy is constructed, based only on positional information, which guarantees completion of the pursuit. The strategy is also valid when the convex shell of the pursuers' initial positions is the empty set. References 9 Russian.
[105-6900]

NUMERICAL ANALYSIS AND STATISTICS

CONFERENCE MARKS ANNIVERSARY OF UNIVERSITY'S MATHEMATICS CHAIRS

SOVETSKAYA ESTONIYA No 241, 18 Oct 85 p 2

FLYAYSHER, A., senior science associate of Tartu State University, scientific secretary of the organizing committee of the conference "Theoretical and Applied Questions of Mathematics"

[Abstract] The author comments on results of a conference, "Theoretical and Applied Questions of Mathematics", which was held in Tartu late in September. This conference marked the 40th anniversary of the chairs of algebra and geometry, mathematical analysis, and theoretical mechanics of Tartu State University (TGU). The author salutes the work of outstanding mathematicians who have been associated with this university. Among them are Professor Gennadiy Vaynikko, now head of the university's chair of computer mathematics, and Yulo Kaazik, who pioneered computer-programming research in the Estonian republic. Kaazik is now a professor of TGU's chair of programming.

The author reports that leading scientists from Moscow, Sverdlovsk, Novosibirsk, Riga, Vilnius, Tbilisi, Yerevan, Tiraspol' and Odessa attended the Tartu conference. The participants devoted particular attention to software for methods of computation and to the strengthening of ties between specialists in theoretical and applied disciplines, including theoretical cybernetics and physics, mathematical statistics, and data analysis.

Participants in the conference who receive special mention include Doctor of Sciences Tayvo Arak, senior science associate of the Estonian Academy of Sciences' Institute of Cybernetics and a product of the Leningrad mathematics school. It is recalled that Arak was the first Estonian mathematician to be awarded the USSR Academy of Sciences' Prize imeni Markov, for his work on demonstrating Kolmogorov limit theorems of probability theory. Ivar Petersen and Ene-Margit Tiyt, a leading specialist in the application of statistical analysis, are identified as two mathematicians of an older generation who laid the groundwork for research in this area in Estonia.

FTD/SNAP
/9716
CSO: 1862/60

COMPUTERIZATION DEMANDS ADVANCED MATHEMATICAL MODELING

Moscow NTR: PROBLEMY I RESHENIYA, 16 Jul-3 Aug 85, No 5, pp 1, 4, 5

SAMARSKIY, A.A., academician, mathematician and physicist

[Abstract] The author discusses at length the importance of advancing computer mathematics and mathematical modeling. He observes that there is a certain tendency to divorce questions of mathematical modeling from problems of the development of computer technology, with the result that the pace of development of computer mathematics is lagging behind that of computer technology.

Explaining how computers can help to solve extremely complex, large-scale scientific, economic and social problems, the author says that today computers for mass use are being developed, as well as specialized supercomputers with capacities of 100 million to 10 billion operations per second. The author contends that the approach to their development must be different from the approach that has been taken in the past. He explains:

"A computer system that serves scientists must reflect the specifics of the scientific investigation. The active principle must be: not to 'fit' the task to the machine, but the machine to the task. That is, adapt computers together with their mathematical support to definite classes of problems. Roughly speaking, it should proceed this way: given a problem or a mathematical model, construct a computer algorithm for it, compile a program on the basis of the algorithm, and then develop a computer that will execute the program."

The author goes on to discuss computer experiments, their methodology, and how they can help to solve problems in various fields of science and technology. He then assesses the state of mathematical modeling and its application, and discusses what needs to be done to improve it. Saying that computer mathematics and mathematical modeling must set the pace for development of computer technology, the author observes that too few mathematicians are doing applied work on computer technology. He says there is a need to create libraries of standard algorithms on a new methodological base, as well as packages of applied programs for various classes of problems. There exists a fairly large number of packages of applied programs at the present time, but the author says they are not gaining wide use, due to a lack of information, lack of trust in someone else's results, and other reasons. He says development of computer programs is in the hands of a relatively few specialists who are in effect determining the level and the effectiveness of all work on the use of computer technology, and he suggests that their expertise is mediocre at best.

Finally, addressing the question of what is holding back the use of computer experiments, the author says there is a shortage of mathematical models in many fields, and some groups of scientists underestimate computer experiments. Institutes that possess highly qualified specialists and good experience in computer applications often are poorly equipped. Where mathematical models are on hand, often not enough work is done on studying the properties of the object to be investigated and determining the parameters that must go into equations. The author calls for the creation of centers for calculating parameters of the object of study and its environment in the chemical, biological, physical and economic sciences. He also recommends the creation of mixed groups of physicists and mathematicians for carrying out R&D work based on computer experiments.

A photograph of Samarskiy is given.

FTD/SNAP
/9716
CSO: 1862/60

NUMERICAL ANALYSIS AND ALGORITHMS

UDC: 517.5+518.944

SOME THEORY OF APPROXIMATION AND NUMERICAL ANALYSIS PROBLEMS

Moscow USPEKHI MATEMATICHESKIKH NAUK in Russian, Vol 40, No 1 (241), Jan-Feb 85 (manuscript received 10 Feb 84) pp 3-28

BABENKO, K.I., Institute of Applied Mathematics imeni M.V. Keldysh, USSR Academy of Sciences.

[Abstract] A number of approximation theory problems that are important in numerical analysis are formulated. Different methods for digitizing functional compacts are examined, and optimum methods are identified. Certain approximation theory problems for functions of finite smoothness are examined. Construction of non-saturating numerical algorithms is investigated. Approximation of infinitely differentiable classes of functions is explained. The role of modern computer speed and memory capacity is discussed as related to general problems of digitizing functional compacts. References 30: 27 Russian, 3 Western.
[345-6900]

UDC 519.8

WEIGHTED SEARCH FOR SOLUTION OF MULTIOBJECTIVE MATHEMATICAL PROGRAMMING PROBLEM

Tashkent IZVESTIYA AKADEMII NAUK UZSSR. SERIYA TEKHNICHESKIKH NAUK in Russian No 6, Nov-Dec 84 (manuscript received 30 Nov 82) pp 19-21

TUKHVATOV, M.V., Tashkent National Economic Institute

[Abstract] A weighted search is proposed for solving mathematical programming problems for multipurpose systems or tasks. The search is based on weight functions proposed elsewhere by the author that determine the preference of the variables used as densities for finding the center of mass of an inhomogeneous body (problem domain). A multiobjective problem is presented, along with four different solution methods. The fundamental factors that must be taken into account in evaluating the solutions are identified. References: 5 Russian.
[363-6900]

APPLICATION OF UNIFORMLY DISTRIBUTED SEQUENCES IN COMPUTATIONAL MATHEMATICS

Moscow MATEMATIKA, KIBERNETIKA. POLUCHNAYA NAUCHNO-POPULYARNAYA SERIYA in Russian No 2, Feb 85 (signed to press 22 Jan 85) pp 26-32

SOBOL', I.M.

[Abstract] This text represents Chapter 3 of a monograph entitled "Points Uniformly Filling a Multidimensional Cube." Chapter 3 describes the approximate computation of multidimensional integrals, and extends the results of the preceding chapters. The use of quasirandom points in Monte Carlo algorithms instead of random points to guarantee convergence of the algorithms is described. The concept of an LP-sequence is introduced: a sequence is called an LP_0-sequence if any binary segment of it represents a P_0-network. The concept of an LP-search in a cube is presented; a simple search is an LP-search if the test points are the points of an LP-sequence. Multicritical optimization in machine design is described. References 5: 4 Russian, 1 Western.
[362-6900]

UDC: 62-502.72

FAST ALGORITHM FOR SOLVING A NETWORK DISTRIBUTION PROBLEM AND ITS APPLICATION

Alma Ata IZVESTIYA AKADEMII NAUK KAZAKHSKOY SSR. SERIYA FIZIKO-MATEMATICHESKAYA in Russian No 1 (122), Jan-Feb 85 (manuscript received 24 Sep 84) pp 87-89

KIM, K.V. and NI, O.V., Central Economics-Mathematical Institute, USSR Academy of Sciences, Institute of Mathematics and Mechanics, Kazakh SSR Academy of Sciences.

[Abstract] An algorithm is proposed for solving a network distribution problem based on a procedure described in a previous study by the author. In solving the network distribution problem, a reference plane is first constructed, and potentials are computed for it, after which the optimality condition is checked and a candidate list is drawn up. The coefficients of the change in the amount of traffic are then computed for each communication from the candidate list, and a decision is made about whether to add a given communication to the basis or not. The algorithm is much faster than ordinary implementations of the generalized method of potentials, making it especially effective for models that converge to a solution for a series of distribution problems.
References 2 Russian.
[369-6900]

PROBABILITY AND STATISTICS

UDC: 519.21

ASYMPTOTIC BEHAVIOR OF PROJECTION ESTIMATES FOR PROBABILITY DISTRIBUTION DENSITY

Tbilisi SOOBSHCHENIYA AKADEMII NAUK GRUZINSKOY SSR in Russian Vol 115, No 3, Sep 84 (manuscript received 25 Feb 83) pp 477-480

BUADZE, T.G., Georgian Polytechnical Institute imeni V.I. Lenin.

[Abstract] The asymptotic behavior of the Laplace transform $L_z(\eta_{n,N})$ - the integral-quadratic deviation $\eta_{n,N}$ of the projection estimate from the true density value - is studied by reducing the investigation of the quadratic functional of the empirical distribution function to the investigation of a linear function of that distribution, and then of the quadratic function of some Gaussian field. Sufficient conditions are established for the asymptotic normality of $\eta_{n,N}$. References 3 Russian.
[254-6900]

UDC 519.856

PRINCIPLES OF MULTIVARIANT DOMINATION IN OPTIMUM CONTROL OF TECHNOLOGICAL PROCESSES

Tashkent IZVESTIYA AKADEMII NAUK UZSSR. SERIYA TEKHNICHESKIKH NAUK in Russian No 6, Nov-Dec 84 (manuscript received 20 July 84) pp 6-10

ALIYEV, E.M., Uzbek Kibernetika Scientific-Production Association, Uzbek SSR Academy of Sciences

[Abstract] A method is proposed for selecting optimum solutions for technological processes with predictive quality indicators. The concepts of preference distribution of acceptable variants, an optimization model of multivariant domination, and multivariant domination distribution with respect to the optimization model are introduced. Four principles are cited for optimization models of multivariant domination. The definitions and principles introduced make it possible to adequately select and describe a prediction procedure and optimal control algorithm for technological processes with predictive quality indicators. References 5: 4 Russian, 1 Western.
[363-6900]

UDC: 519.6:517.977.56

REGULARIZATION OF ILL-POSED OPTIMUM CONTROL PROBLEMS FOR PROCESSES DESCRIBED BY PARABOLIC EQUATIONS

Alma Ata IZVESTIYA AKADEMII NAUK KAZAKHSKOY SSR. SERIYA FIZIKO-MATEMATICHESKAYA in Russian No 1 (122), Jan-Feb 85 (manuscript received 16 May 84) pp 53-56

NERONOV, V.S., Kazakh State University imeni S.M. Kirov.

[Abstract] Boundary conditions are defined for a controlled process in a region bounded by piecewise-smooth surface S. Correct statement of the optimum control problem is investigated. The use of A.N. Tikhonov's regularization method for solving ill-posed problems is described. References 6 Russian.
[369-6900]

UDC: 62-501.72

CONVERGENCE OF SUCCESSIVE REFINEMENTS OF OPTIMUM TRAJECTORY PROJECTIONS

Tbilisi SOOBSHCHENIYA AKADEMII NAUK GRUZINSKOY SSR in Russian Vol 115, No 3, Sep 84 (manuscript received 6 Oct 83) pp 605-608

TSINTSADZE, T.Yu., Institute of Problems of Control, Ministry of Instrument Engineering, and USSR Academy of Sciences.

[Abstract] An iterative process for determining projections of an optimal trajectory for a linear problem with quadratic criterion is examined. A theorem regarding the convergence of the successive refinement procedure is stated and proved. References 2 Russian.
[254-6900]

UDC: 62-50

THE PROBLEM OF CONTROL UNDER CONDITIONS OF INCOMPLETE INFORMATION

Moscow PRIKLADNAYA MATEMATIKA I MEKHANIKA in Russian Vol 48, No 4, Jul-Aug 84 (manuscript received 15 Dec 83) pp 533-539

KRASOVSKIY, N.N.

[Abstract] A problem of controlling a differential system with incomplete information about the interference and phase states of the object is examined. The problem is stated as one of controlling an evolution system whose states are determined by an information variable. The problem is solved by programmed stochastic synthesis. The method employed is effective for numerical formation of optimum controls which can be implemented in real time in actual control processes. References 3 Russian.
[105-6900]

UDC: 62-50

SIMULATION PROBLEM OF CONTROLLING LATERAL MOVEMENT OF AIRCRAFT DURING LANDING APPROACH

Moscow PRIKLADNAYA MATEMATIKA I MEKHANIKA in Russian Vol 48, No 4, Jul-Aug 84 (manuscript received 1 Aug 83) pp 560-567

BOTKIN, N.D., KEYN, V.M. and PATSKO, V.S.

[Abstract] The problem of controlling lateral movement of an aircraft in the final phase of landing under windy conditions is investigated. A vector differential equation is derived to describe the lateral movement of an aircraft

in linear approximation. The problem is formalized as an antagonistic positional differential close-end game between two players with a convex payoff function. The controlling parameter of the first (minimizing) player is a scalar, so that a universal stable optimum strategy exists for the first player. The movements of the initial system of equations are modeled for the initial conditions of one of the parameters at the moment $T_o = 0$. It is found that a linear control principle does not guarantee a successful landing approach under extreme perturbation, but that a combined method does provide such a guarantee. Linear control likewise does not guarantee a successful landing in the absence of extreme perturbations if initial deviations, which the combined control principle can handle, are large. References 13 Russian. [105-6900]

UDC 621.396.969.1

PARAMETRIC OPTIMIZATION OF ALGORITHM FOR ESTIMATING VALUES OF ONE CLASS OF UNSTEADY RANDOM PROCESSES

Alma-Ata IZVESTIYA AKADEMII NAUK KAZAKHSKOY SSR: SERIYA FIZIKO-MATEMATICHESKAYA in Russian No 5, Sep-Oct 84 (manuscript received 11 May 83) pp 77-81

KRYZHANOVSKIY, G.A. and ALESHIN, V.I., Higher Civil Aviation Flight School, Aktyubinsk.

[Abstract] This study investigates optimization of the measurement processing algorithm employed in automated air traffic control systems with respect to such observation parameters as the number of measurements processed, the digitization interval and the weighted coefficients of the algorithm. The longitudinal and lateral components of the ground speed vector are calculated by the least-squares method, using a linear approximating function. The variance of the approximating function in the region of the airport is defined as the efficiency indicator in the problem of parametric optimization of the traffic control algorithm. The approach employed makes it possible to make maximum use of the capabilities of existing automated air traffic control systems and to improve ground speed determination accuracy. References 5 Russian. [147-6900]

UDC 658.513.001.572

MODEL OF OPTIMUM PRODUCTION CONTROL BASED ON THEORY OF STOCKPILE CONTROL

Tashkent IZVESTIYA AKADEMII NAUK UZBEKSKOY SSR: SERIYA TEKHNICHESKIKH NAUK in Russian No 4, Jul-Aug 85 (manuscript received 11 Apr 85) pp 13-17

SERBULOV, A.V. and TUMENBAYEV, K., Uzbek Scientific-Industrial Association "Kibernetika", UzSSR Academy of Sciences

[Abstract] A model of a two-level production system is constructed in which the necessary resources are not lumped into a single equivalent one, as has been done in the past, but are subdivided into two, representing, respectively,

all irreversibly expandable ones such as raw materials and all renewable ones such as equipment. A two-level single-product manufacturing process is simulated on this basis for the purpose of its optimum control, assuming that such a system consists of n kinds of differently processable items and that resources of the first type (nonrenewable) enter the system according to a given law of supply. These resources are to be optimally controlled, while the resources of the second type remain constant and are periodically monitored for any given time element (day, 10 days, month) in accordance with the equipment insurance schedule. Each individual item on the raw materials list is assumed to enter the system a random number of times and at random instants of times in random amounts during its subperiod of the manufacturing cycle, the only constraint being that the total amount entering be equal to the amount made available for that subperiod. This problem of optimum control can be solved by simulation methods only; conventional iteration procedures must, moreover, be modified here so as to take into account the highly particularized nature of nonrenewable resources in any enterprise. A computer simulation according to the Monte Carlo method is then possible, after all items have been sorted on the basis of importance, with each item being treated "as planned" and "under pressure" with absolute priority to any more important item over any less important item under both conditions. References 6: 5 Russian, 1 Western.
[51-2415]

UDC: 62-50

SEARCH FOR A STATIONARY TARGET BY A MOVING OBJECT

Moscow PRIKLADNAYA MATEMATIKA I MEKHANIKA in Russian Vol 48, No 4, Jul-Aug 84 (manuscript received 5 Sep 83) pp 580-583

CHIKRIY, G.Ts.

[Abstract] This study examines the problem of stationary target search by a controlled object whose motion is described by a system of ordinary differential equations or a linear discrete system with assigned initial position probability distribution density. Necessary conditions are derived for optimal control to maximize the probability of the object's trajectory reaching the required target set within a fixed amount of time. References 6 Russian.
[105-6900]

UDC: 519.6:517.958

NUMERICAL SOLUTION OF RIGID BOUNDARY-VALUE PROBLEMS OCCURRING IN TRANSFER THEORY

Alma Ata IZVESTIYA AKADEMII NAUK KAZAKHSKOY SSR. SERIYA FIZIKO-MATEMATICHESKAYA in Russian No 1 (122), Jan-Feb 85 (manuscript received 22 Oct 84) pp 56-59

SULTANGAZIN, U.M. and KHAMIDOV, A.G., Institute of Mathematics and Mechanics, Kazakh SSR Academy of Sciences.

[Abstract] A boundary-value problem for a linear system of differential equations with a unique solution and specified boundary conditions is examined. A numerical solution method is proposed for the boundary-value problem which occurs in the spherical harmonic method (used for a transfer equation in a spherical domain). The approximation by the spherical harmonic method provides an accurate solution to the original transfer problem. References 5 Russian. [369-6900]

/9716
CSO: 1862

END

END OF FICHE DATE FILMED

27 January 1986